INSTRUCTION MANUAL

for

RADIO INTERFERENCE–FIELD INTENSITY MEASURING EQUIPMENT NM-22A

STODDART AIRCRAFT RADIO COMPANY, INC.

6644 SANTA MONICA BOULEVARD

HOLLYWOOD 38, CALIFORNIA

HOllywood 4-9292

INSTRUCTION MANUAL
FOR MODEL NM-22A
RADIO INTERFERENCE AND
FIELD INTENSITY MEASURING EQUIPMENT

STODDART
AIRCRAFT RADIO CO., INC.
LEADER IN RFI CONTROL
6644 Santa Monica Blvd. • Hollywood 38, California
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5 November 1963

REPLY TO ATTN. OF: SEDTE (Mr. Seth)

SUBJECT: NM-22, Approval of

TO: Stoddart Aircraft Radio Company, Inc.
Attn: (Mr. D. Radmacher)
6644 Santa Monica Boulevard
Hollywood 38, California

The Stoddart NM-22A, Radio Interference and Field Intensity Meter, is approved for use with MIL-I-6181 and MIL-I-26600. This approval applies only for Air Force procurements.

Samuel Skolnik

SAMUEL SKOLNIK
Chief, Electromagnetic Compatibility Branch
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SECTION I

GENERAL INFORMATION AND OPERATING INSTRUCTIONS

1.1 GENERAL INFORMATION

The STODDART NM-22A RI-FI instrumentation, shown in Figure 1-1, is designed for analyzing conducted and radiated RF energy within the frequency range of 150 kilocycles to 32 megacycles. The equipment includes a RI-FI Meter, an AC Power Supply, and various accessories which make numerous applications possible. Except for additional features and improvements, the NM-22A is the commercial equivalent of the AN/URM-131(XN-1) developed for the Bureau of Ships. The equipment is extremely versatile, and is suitable for use in the field, aboard vessels, in aircraft, and in vehicles.

The RI-FI Meter is a highly sensitive superheterodyne receiver which functions as a tuneable RF microvoltmeter. By means of an internal impulse calibrator, the gain of the receiver can be accurately calibrated at each signal measurement frequency. The frequency range is covered in eight bands, with adequate overlap between bands. Single conversion is used for Bands 1, 2, 5, and 6, and dual conversion for the remaining bands. Three measurement functions are available, as follows:

1. FIELD INTENSITY (FI). - This function can be used for measuring the average RMS carrier level of narrowband signals. Also, when the output of the RI-FI Meter is monitored with an oscilloscope, the FI function can be used for observing modulation envelope patterns.

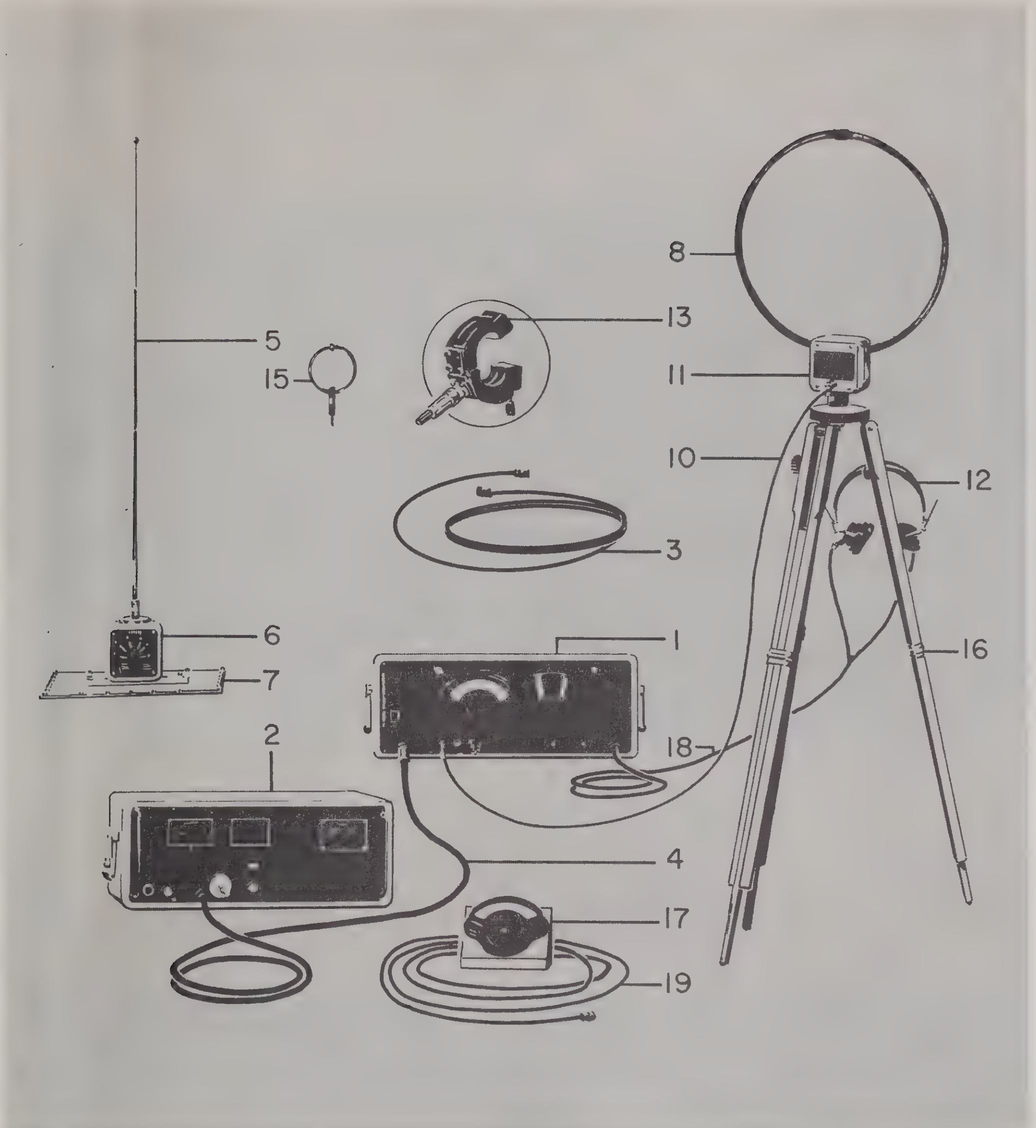
2. QUASI-PEAK (QP). - This function is useful for measuring either (a) the RMS carrier level of an unmodulated signal, or (b) the average carrier plus modulation level of a modulated signal.

3. PEAK. - This function is used mainly for measuring broadband signals in terms of peak values.

Output jacks are provided on the front panel of the RI-FI Meter for HEADPHONES, an OSCILLOSCOPE, a REMOTE METER, a RECORDER, and an X-Y PLOTTER.

1.2 EQUIPMENT CONTROLS AND RECEPTACLES

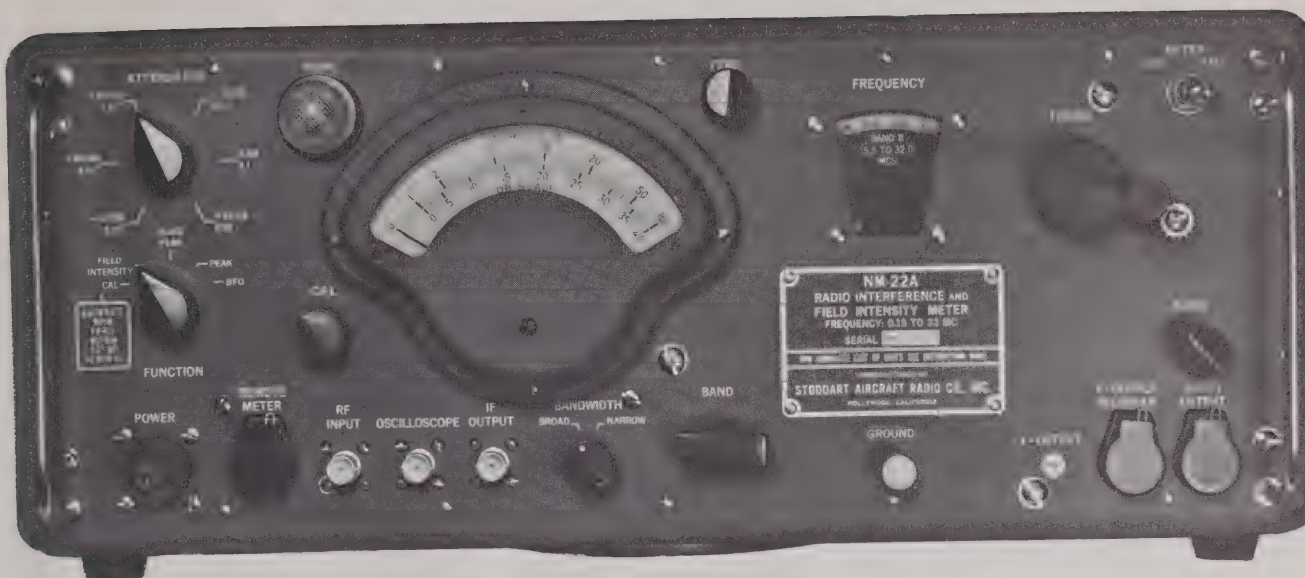
All external operating controls are located on the front panels of the RI-FI Meter and the AC Power Supply (see Figure 1-2). External controls and receptacles are listed and described in Tables 1A (RI-FI Meter) and 1B (AC Power Supply).



ITEM	STODDART NUMBER	DESCRIPTION
1	NM-22A	Radio Interference-Field Intensity Meter, Frequency Range—150 kc to 32 mc
2	91923-2	AC Power Supply
3	91258-1	AC Power Cable, 6 ft.
4	91487-1	Power Supply Cable, 10 ft.
5	92197-3	Rod Antenna, Remote, 41 inches
6	92198-3	Antenna Coupler for 92197-3
7	92199-3	Ground Plane
8	92200-3	Loop Antenna, Remote
* 9	93049-1	Rod Antenna, 9 ft., with coupler
10	92191-1	RF Transmission Line, 20 ft.
11	92192-3	Antenna Coupler Adapter, High Impedance
12	10796	Headphones
13	91550-1	RF Current Probe
*14	11663	Coaxial Connector (N-BNC)
15	90799-3	Loop Probe
16	91933-2	Tripod
17	90078-11	Remote Meter
18	90074-1	Headphone Extension Cable, 20 ft.
19	90075-2	Remote Meter Cable, 20 ft.
*20	90071-1	Oscilloscope Cable, 3 ft.
*21	92244-2	X Output Cable, 6 ft.
*22	90075-4	Y Output Cable, 6 ft.
*23	91595-10	Meter Transit Case
*24	91595-4	Power Supply Transit Case
*25	92220-3	Accessory Case
*26	92049-1	Tripod Bag (Holds one tripod)
*27	91981-2	Cable Bag
*28	—	Instruction Book
*29	91263-1	Impulse Generator

NOTES: *Items not shown.

NM-22A EQUIPMENT AND ACCESSORIES



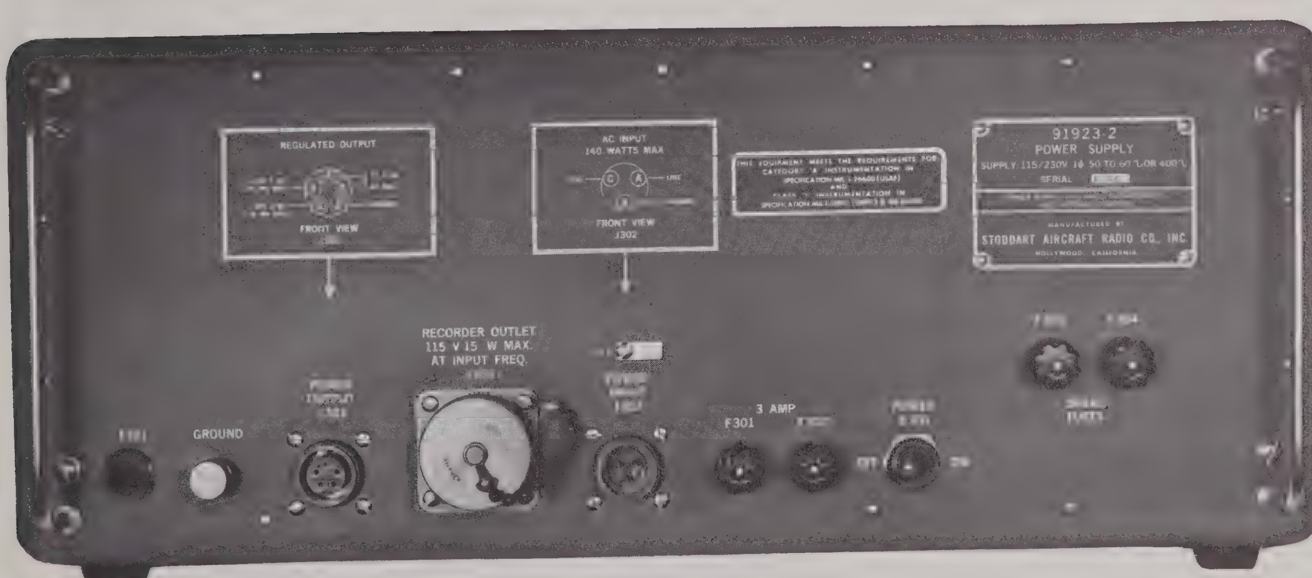


FIGURE I-2 FRONT PANEL VIEWS OF RI-FI METER & AC POWER SUPPLY

TABLE 1A

RI-FI METER

DESIGNATION AND FUNCTION OF FRONT PANEL CONTROLS AND RECEPTACLES

PANEL LEGEND		FUNCTION
ATTENUATOR		Determines total signal attenuation in six steps from -20 db to +80 db, as follows:
X0.1	-20 db	Does not attenuate RF or IF signal. Signal input is one tenth of meter reading in microvolts.
X1	0 db	Does not attenuate RF signal but does attenuate IF signal by 20 db.
X10	+20 db	Attenuates RF signal 20 db and IF signal 20 db.
$X10^2$	+40 db	Attenuates RF signal 40 db and IF signal 20 db.
$X10^3$	+60 db	Attenuates RF signal 60 db and IF signal 20 db.
$X10^4$	+80 db	Attenuates RF signal 80 db and IF signal 20 db.
FUNCTION		Selects measurement function as follows:
CAL		Disconnects RF input and energizes impulse calibrator.
FIELD INTENSITY		Weights signal to permit measurement in terms of average signal values.
QUASI-PEAK		Weights signal to permit measurement near the peak value of input signals.
PEAK		Applies reverse bias to detector for slideback signal measurements.
BFO		Places beat frequency oscillator in operation to permit audible reception of cw signals. Disables front panel meter.
BAND		Switches RF turret tuner to select proper tuned circuits for bands 1 to 8.
TUNING		Controls the main tuning capacitor of the RF tuner; tunes the receiver within the selected band.
METER SLOW/FAST		Selects response time of front panel meter, as follows:

DESIGNATION AND FUNCTION OF FRONT PANEL CONTROLS AND RECEPTACLES (Continued)

PANEL LEGEND	FUNCTION
SLOW	Lengthens meter response time.
FAST	Establishes normal meter response characteristics.
CAL	Adjusts the overall gain of the receiver.
PEAK (Control)	Controls level of reverse bias applied to detector for slideback peak measurements.
PEAK (Lamp)	Provides visual indication of signal threshold level during slideback peak measurements.
AUDIO	Adjusts level of audio output signal.
BANDWIDTH	Changes overall receiver bandwidth as follows:
BROAD	Removes crystal filter from IF system.
NARROW	Places crystal filter in IF system.
RF INPUT	RF signal input receptacle of RI-FI Meter.
OSCILLOSCOPE	Permits connection of oscilloscope for visual monitoring of RI-FI Meter detector output.
"X" OUTPUT	Provides dc potential proportional to tuning dial rotation for X-Y plotter.
AUDIO OUTPUT	Headphone receptacle for audio monitoring.
"Y" OUTPUT, RECORDER	For operation of an output recorder or an X-Y plotter in series with front panel meter.
REMOTE METER	Permits an external meter to be connected in series with the front panel meter.
IF OUTPUT	Provides an output signal from the IF amplifier.
GROUND	Permits an external ground to be connected to the RI-FI Meter.
POWER	Receptacle for power input from AC Power Supply.

TABLE 1B

AC POWER SUPPLY

DESIGNATION AND FUNCTION OF FRONT PANEL
CONTROLS AND RECEPTACLES

PANEL LEGEND	FUNCTION
POWER	Power switch, used in the following manner:
ON	Energizes the equipment.
OFF	De-energizes the equipment.
POWER INPUT	Receptacle for connection to external AC power source.
POWER OUTPUT	Delivers power to RI-FI Meter.
POWER OUTLET 115v, 10 w	Delivers power to operate on external recorder when the line frequency meets recorder requirements.
GROUND	Permits connection of an external ground.
I301	Power ON indicator.
F301, F302	Line fuses, 3 amperes.
F303, F304	Spare fuses, 3 amperes.

1.3 POWER REQUIREMENTS

The RI-FI Meter operates from power furnished by the AC Power Supply. This power supply must be connected to a single phase AC source of either 105 to 125, or 210 to 250 volts, with a frequency of 50, 60, or 400 cycles per second. During normal operation the total power drawn from the AC source is approximately 135 watts.

1.4 INITIAL SETUP

STEP 1. Open the Meter Transit Case, and remove the protective cover from the RI-FI Meter. Then, using the handles on the front panel, remove the RI-FI Meter from the transit case.

STEP 2. Place the RI-FI Meter on any convenient flat surface.

NOTE

During normal operation the RI-FI Meter can be placed in any position. However, during calibration the front panel must be vertical within ±30 degrees, or the mercury switch impulse calibrator will not function properly.

STEP 3. Open the Power Supply Transit Case and remove the protective cover from the front panel. Then, using the handles on the front panel, remove the power supply from the transit case.

STEP 4. Check the line voltage reminder tag, located directly above J302, to see if the setting coincides with the available source voltage. If so, proceed to STEP 8; if not, perform STEPS 5, 6, and 7.

STEP 5. Remove the binder head screws from the rear of the power supply case, and slide the chassis out of the case.

STEP 6. Set the line voltage selector, S302, to either the LOW VOLTAGE (105-125) or HIGH VOLTAGE (210-250) position, as required.

STEP 7. Re-install the chassis in the power supply case. Set the reminder tag on the front panel to show the position of the line voltage selector.

STEP 8. Place the power supply within 10 feet of the RI-FI Meter, and within 6 feet of the AC power source.

STEP 9. Open the Cable Bag, and remove both the 10 foot Power Cable and the 6-1/2 foot AC Cable.

STEP 10. Connect one end of the 10 foot Power Cable to the POWER OUTPUT receptacle of the power supply. Connect the other end of this cable to the POWER INPUT receptacle of the RI-FI Meter.

STEP 11. Connect a good external ground to the GROUND binding post on the power supply. To avoid multiple ground paths, only one ground connection should be made to the equipment.

STEP 12. Connect one end of the 6-1/2 foot AC Cable to the POWER INPUT receptacle of the power supply. Connect the other end of this cable to the AC power source.

STEP 13. Place the power supply ON/OFF switch in the ON position. Allow a short warmup period before making measurements.

1.5 CONNECTION OF RF TRANSMISSION LINE

STEP 1. Remove the 20 foot RF Transmission Line from the Cable Bag.

STEP 2. Connect one end of the transmission line to the RF INPUT receptacle of the RI-FI Meter.

STEP 3. Connect the other end of the transmission line to the signal source.

NOTE

The RF transmission line can be connected to any 50 ohm signal source, but the total DC and RF power must not exceed 1/2 watt or the RI-FI Meter may be damaged.

The RF transmission line can be connected to signal sources of higher or lower impedance if the resulting mismatch is acceptable.

1.6 INSTALLATION OF ROD ANTENNA

STEP 1. Remove the Rod Antenna and the Antenna Coupler from the Accessory Case.

STEP 2. Connect the OUTPUT receptacle of the Antenna Coupler to the RF INPUT receptacle of the RI-FI Meter, using the 20 foot RF Transmission Line.

STEP 3. Attach the Rod Antenna to the insulated input receptacle centered on top of the Antenna Coupler.

STEP 4. Extend the Rod Antenna to its maximum length.

STEP 5. Set the BAND selector of the Antenna Coupler to the same band as the RI-FI Meter.

The Antenna Coupler can be mounted on either the Tripod or the Ground Plane. When mounted on the Tripod, a good external ground should be connected to the case of the unit. An external ground should also be connected when the coupler is fastened to the Ground Plane, since the Ground Plane alone is not large enough to act as a counterpoise. For screen room measurements,

the Antenna Coupler can be fastened to the Ground Plane, and the Ground Plane in turn can be connected to the screen room ground.

1.7 INSTALLATION OF LOOP ANTENNA

STEP 1. Remove the Loop Antenna from the Accessory Case, and mount the antenna in a vertical position on the tripod.

STEP 2. Connect the 20 foot RF Transmission Line between the Loop Antenna OUTPUT receptacle and the RF INPUT receptacle of the RI-FI Meter.

STEP 3. Set the BAND selector on the loop base to the same band as the RI-FI Meter.

1.8 EQUIPMENT SETUP FOR HIGH IMPEDANCE CONDUCTED MEASUREMENTS

STEP 1. Remove the Antenna Coupler and the Antenna Coupler Adapter from the Accessory Case.

STEP 2. Connect the OUTPUT receptacle of the Antenna Coupler to the RF INPUT receptacle of the RI-FI Meter, using the 20 foot RF Transmission Line.

STEP 3. Attach the Antenna Coupler Adapter to the Antenna Coupler.

STEP 4. Connect the red terminal of the adapter to the signal source, and the black terminal to ground. All other ground connections to the equipment should be removed to avoid ground loops. The length of the connecting leads should be kept as short as possible.

CAUTION

The peak input voltage applied to the adapter terminals must not exceed 500 volts dc, and the total input power must not exceed 1/2 watt.

STEP 5. Set the BAND selector of the Antenna Coupler to the same band as the RI-FI Meter.

1.9 CONNECTION OF CURRENT PROBE

STEP 1. Remove the Current Probe from the Accessory Case, and connect the 20 foot RF Transmission Line between the Current Probe output receptacle and the RF INPUT receptacle of the RI-FI Meter. The type "N" to "BNC" adapter supplied in the Accessory Case must be used to connect the transmission line to the probe.

STEP 2. Instructions for using the Current Probe are given in a separate instruction manual supplied in the Accessory Case.

1.10 CONNECTION OF LOOP PROBE

STEP 1. Remove the Loop Probe from the Accessory Case, and connect the 20 foot RF Transmission Line between the Loop Probe output receptacle and the RF INPUT receptacle of the RI-FI Meter.

STEP 2. Signal leakage from sources of limited accessibility can be detected by orienting the Loop Probe by hand. No calibration figures are provided, since the loop is intended for relative indications only.

1.11 TRIPOD ADJUSTMENTS

The center of each tripod leg is fitted with an adjustable extension section. To adjust this section the lower knob on the tripod leg must be loosened.

The upper knob on each tripod leg must be loosened to allow the legs to be spread to a stable position.

1.12 OPERATIONAL CHECKS AND ADJUSTMENTS

When the RI-FI Meter and AC Power Supply are first set up for use at a particular site, the following preliminary checks should be performed to make certain that the equipment is operating properly:

STEP 1. With the equipment de-energized, check the mechanical zero of the front panel meter. If the meter does not indicate zero, correct by adjusting the screw on the front of the meter case.

STEP 2. Turn the POWER ON/OFF switch to the ON position. The pilot lamp on the AC Power Supply and the dial lamp of the RI-FI Meter should both light. Allow a warmup period of about 5 minutes.

STEP 3. Rotate the FUNCTION switch to the BFO position, and check to see if the meter reading remains within approximately 1/16 inch of zero. If so, proceed to STEP 4. If the meter reading differs from zero by more than 1/16 inch deflection, proceed as follows:

a) Without changing the setting of the FUNCTION switch, remove the chassis from the RI-FI Meter case (removal procedures are given in Section 3 of the complete Instruction manual).
b) Locate the ADJ ZERO potentiometer, R274, and adjust for a meter reading of zero. Tighten the locknut.
c) Re-install the chassis in the RI-FI Meter case.

STEP 4. Set the operating controls of the RI-FI Meter to the following positions:

FUNCTION - FIELD INTENSITY

ATTENUATOR - $X10^4$ (+80 db)

CAL - Fully Counterclockwise

With no RF input signal, the meter reading should be approximately 1/16 to 3/16 inch above zero. If so, proceed to Step 5. If not, internal adjustments may be required. Refer to Section 3 of the Manual, Paragraph 3.4.

STEP 5. Connect the Rod Antenna to the Antenna Coupler, and connect the RF Transmission Line between the OUTPUT receptacle of the coupler and the RF INPUT receptacle of the RI-FI Meter.

STEP 6. Plug the headphone set into the AUDIO output jack of the RI-FI Meter.

STEP 7. With the FUNCTION switch in the FI position, tune the receiver from the low end to the high end of each band. Listen for signals to make certain that the equipment is operating on each band. While tuned to a steady signal, set the ATTENUATOR and CAL controls for an on-scale meter reading, and adjust the AUDIO control for the desired volume.

STEP 8. To check the slideback measurement facility, proceed as follows: Tune the RI-FI Meter to a modulated RF signal, and adjust the ATTENUATOR and CAL controls for a reading in the upper portion of the meter scale; then, rotate the FUNCTION switch to the PEAK position. With the PEAK control fully counterclockwise, the PEAK lamp should light and the signal should be audible in the headphones. As the PEAK control is rotated slowly clockwise, the signal should become inaudible and the lamp should become extinguished.

1.13 NM-22A RI-FI CALCULATOR

Simplified procedures for operating and calibrating the NM-22A are printed on the back of the RI-FI Calculator supplied with the equipment. This calculator is a specially designed slide rule which allows an operator to calibrate the equipment and make the type of measurement desired without referring to the instruction manual. The RI-FI calculator is particularly useful when the equipment is to be operated in the field under conditions which would make reference to the manual inconvenient.

In the event that (a) the RI-FI calculator is not available, or (b) more detailed instructions are desired, the following paragraphs contain complete instructions for operating and calibrating the equipment.

1.14 CALIBRATION PROCEDURES

For some applications, the RI-FI Meter may be used primarily as a signal level indicator to obtain readings that are intended for reference purposes only. For such applications, the equipment need not be calibrated. However, the RI-FI Meter must always be calibrated before accurate measurements can be taken. This calibration must be performed at each signal measurement frequency.

During calibration, the front panel of the RI-FI Meter must be vertical. A tolerance of ±30 degrees is allowable, but cannot be exceeded without impairing the operation of the mercury switch impulse calibrator. To calibrate the equipment, proceed as follows:

STEP 1. Energize the equipment, and allow a warmup period of about 5 minutes.

STEP 2. Rotate the BAND selector and the TUNING control to the desired positions.

STEP 3. Rotate the FUNCTION switch to the CAL position.

STEP 4. Rotate the BANDWIDTH switch to either BROAD or NARROW, as required.

STEP 5. Determine the proper calibration figure by referring to Chart 1 at the end of this section. Calibration figures for the BROAD and NARROW positions of the BANDWIDTH switch are given for each of the eight bands.

STEP 6. Adjust the CAL control to make the panel meter read the calibration figure on the decibel scale.

The gain of the RI-FI Meter is now standardized at the signal measurement frequency, and the instrument is ready for use as a two terminal 50 ohm RF Microvoltmeter. When making measurements, correction factors (in db) for the various signal input devices must be added to all meter readings. These correction factors can be determined from Charts 3 and 4 at the end of this section.

1.15 SIGNAL MEASUREMENT PROCEDURES

1.15.1 Preliminary Steps. -

STEP 1. Select the desired signal input device and connect it to the RF INPUT receptacle of the RI-FI Meter.

STEP 2. Rotate the FUNCTION switch to the FI or QP position. Rotate the BANDWIDTH selector to BROAD or NARROW, as required.

STEP 3. Rotate the BAND selector to the desired band, and tune the receiver to the signal frequency.

STEP 4. Adjust the ATTENUATOR and CAL controls for an on-scale meter reading. Peak the output with the TUNING control. Maintain the meter reading in the upper portion of the scale.

STEP 5. Calibrate the RI-FI Meter at the signal frequency, using the procedure outlined in Paragraph 1.14.

STEP 6. Rotate the FUNCTION switch back to the FI or QP position. Do not change the CAL control setting.

STEP 7. Re-adjust the ATTENUATOR for an output reading in the upper portion of the meter scale.

STEP 8. Note each of the following:

a) The ATTENUATOR setting.

b) The meter reading in db or microvolts.

STEP 9. The value of the measured signal can now be determined by one of the following methods. Refer to the sub-paragraph heading which corresponds to the application of the equipment:

1.15.2 Measuring Sinusoidal RF Signals.

1.15.3 Peak Measurements.

1.15.4 Random Interference Measurements.

1.15.5 Broadband Interference Measurements.

1.15.2 Measuring Sinusoidal RF Signals. - The RI-FI Meter is calibrated in such a manner that when measuring unmodulated carriers the FI, QP, and PEAK readings will be the same, and will be proportional to the average carrier level. When measuring modulated RF, the FI readings will still be proportional to the average carrier level, but the QP and PEAK readings will increase in proportion to the modulation level. For RF carriers modulated by a sinusoidal tone, the percentage of modulation can be determined by noting the ratio of the QP to the FI readings.

The following procedures can be used for computing the level of either conducted or radiated sinusoidal signals. Depending upon the type of measurement, meter readings are referred to in terms of (a) db, (b) db above one microvolt, or

(c) db above one microvolt per meter. These readings can be converted directly to microvolts by referring to the conversion table given in Figure 1-3.

a) 50 Ohm Conducted Measurements: To compute the signal level in DB ABOVE 1 MICROVOLT across 50 ohms, add the meter reading in db to the attenuator setting in db. FOR EXAMPLE: if the meter reading is 26 db when the ATTENUATOR is set to +40 db, the signal level is 26 plus 40, or +66 above 1 microvolt across 50 ohms.

b) High Impedance Conducted Measurements: To compute the signal level in DB ABOVE 1 MICROVOLT, add the antenna coupler correction factor in db (from Chart 3), the meter reading in db, and the ATTENUATOR setting in db. FOR EXAMPLE: if the meter reading is 26 db when the ATTENUATOR is set to +40 db, and the Antenna Coupler correction factor is +10 db, the signal level is 26 + 40 + 10, or 76 db above 1 microvolt.

c) Measurement of Radiated Signals: To compute the signal level in DB ABOVE 1 MICROVOLT PER METER, add the meter reading in db, the ATTENUATOR setting in db, and the proper antenna correction factor in db (this factor can be determined from Chart 3 for the Rod Antenna, or from Chart 4 for the Loop Antenna). FOR EXAMPLE: if the meter reading is 26 db when the ATTENUATOR is set to +40 db, and the antenna correction factor is +10 db, the signal level is 26 + 40 + 10, or 76 db above 1 microvolt per meter.

Some specifications call for measurement of radiated signals in terms of "antenna induced" voltage. To comply with such specifications when the rod antenna is used, add the meter reading in db, the ATTENUATOR setting in db, and the ANTENNA COUPLER correction factor in db. This will give the "antenna induced" voltage in terms of db above 1 microvolt.

1.15.3 Peak Measurements. - The slideback measurement facility can be used to determine the peak value of a signal by using either of the following methods:

a) Visual Method. -

STEP 1. Calibrate the RI-FI Meter at the signal frequency.

STEP 2. Rotate the FUNCTION switch to the PEAK position. Do not change the setting of the CAL control.

STEP 3. Rotate the PEAK control counterclockwise until the PEAK lamp glows.

STEP 4. Slowly rotate the PEAK control clockwise until the PEAK lamp flashes, and is finally just extinguished. Note the meter reading as the threshold point is approached. Maintain the meter reading in the upper portion of the scale by adjusting the ATTENUATOR control.

CONVERSION TABLE
DB TO VOLTAGE RATIO

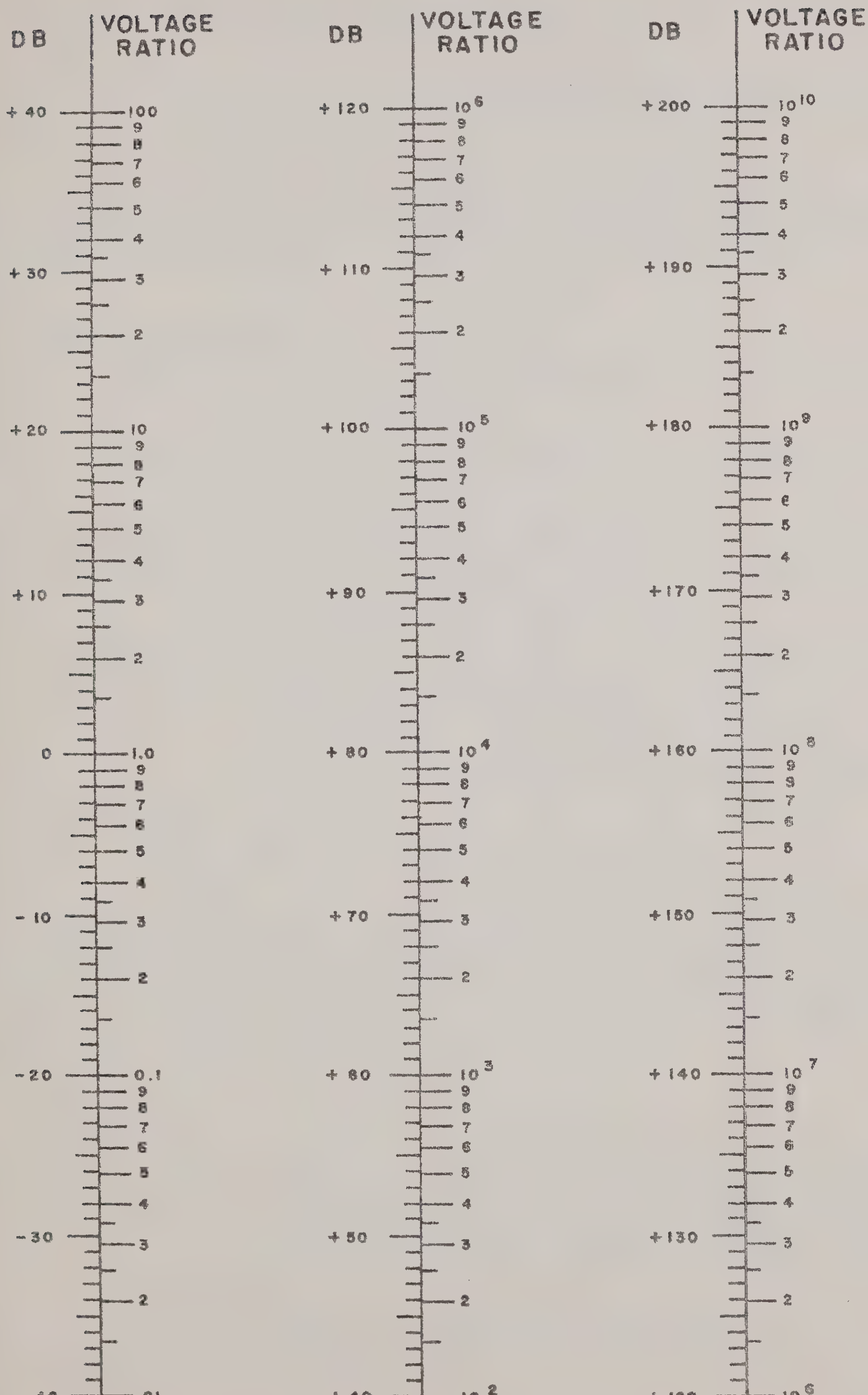


FIGURE 1-3

STEP 5. Note the meter reading and the ATTENUATOR setting at the threshold point.

STEP 6. Add the meter reading in db and the ATTENUATOR setting in db to obtain the signal level in db above 1 microvolt.

The RI-FI Meter is calibrated in terms of RMS sinusoidal values. To find the true peak value of a signal when using the PEAK function, either (1) multiply the meter reading in microvolts by 1.414, or (2) add 3 db to the meter reading in db.

b) Aural Method.-

STEP 1. Plug the headphone set into the AUDIO output jack of the RI-FI Meter.

STEP 2. Calibrate the RI-FI Meter at the signal frequency.

STEP 3. Rotate the FUNCTION switch to the PEAK position.

STEP 4. Rotate the PEAK control counterclockwise until the signal is heard in the headphones.

STEP 5. Slowly rotate the PEAK control clockwise until the signal just becomes inaudible. Observe the meter reading as the threshold point is approached. Maintain the meter reading in the upper portion of the scale by adjusting the ATTENUATOR control.

STEP 6. Compute the signal level in the same manner as outlined for the visual method.

1.15.4 Random Interference Measurements.- When measuring random noise, the FIELD INTENSITY function can be used to determine the average RMS level; or, the QUASI-PEAK function can be used to obtain a "nuisance" value. Measurement of random noise with the PEAK function is not advisable, since the amplitude of this type of noise tends to vary widely during measurement. Random noise bandwidth data for the RI-FI Meter is given in Chart 2.

Procedures.-

STEP 1. Calibrate the RI-FI Meter at the signal frequency.

STEP 2. Rotate the FUNCTION switch to QUASI-PEAK for a "nuisance" value, or to FIELD INTENSITY for an equivalent RMS value.

STEP 3. Adjust the ATTENUATOR to make the meter read in the upper portion of the scale.

STEP 4. Note the meter reading, and compute the signal level by using one of the following procedures:

a) 50 Ohm Two-Terminal Random Noise Measurements. - To find the random noise level in db above 1 microvolt, add the meter reading in db to the ATTENUATOR setting in db. FOR EXAMPLE: if the meter reads 26 db and the ATTENUATOR setting is +40 db, the signal level is 26 + 40, or +66 db above 1 microvolt. To express this level in terms of db above 1 microvolt per kilocycle, subtract a correction factor (in db) corresponding to the square root of the receiver's random noise bandwidth (in kc). This correction factor can be determined by referring to Chart 2.

b) High Impedance Two-Terminal Random Noise Measurements. - When the antenna coupler and the adapter are used as signal input devices, add the meter reading in db, the ATTENUATOR setting in db, and the Antenna Coupler correction factor in db (determined from Chart 3). This gives the signal level, at the input terminals of the adapter, in db above 1 microvolt. To express this level in terms of db above 1 microvolt per kilocycle, subtract a correction factor (in db) corresponding to the square root of the receiver's random noise bandwidth (in kc).

c) Rod or Loop Antenna Random Noise Measurements. - Add the meter reading in db, the ATTENUATOR setting in db, and the appropriate antenna correction factor in db to obtain the random noise field intensity in db above 1 microvolt per meter. Correction factors for the Rod Antenna can be determined from Chart 3 and for the Loop Antenna from Chart 4. To express random noise field intensity in terms of db above 1 microvolt per meter per kilocycle, subtract a correction factor (in db) corresponding to the square root of the receiver's random noise bandwidth in kilocycles.

1.15.5 Broadband Interference Measurements. - Most interference specifications do not distinguish between random and impulse noise. Both are classified as "broadband" interference, and treated as impulse noise. Impulse noise is made up of a series of electrical disturbances, each having a duration considerably less than the reciprocal of the bandwidth of the measuring equipment.

The following procedure can be used to measure broadband interference with the PEAK (slideback) function. In accordance with most interference specifications, no distinction is made between random and impulse noise.

Procedures. -

STEP 1. Rotate the BANDWIDTH switch to the BROAD position.

STEP 2. Calibrate the RI-FI Meter at the signal frequency.

STEP 3. Rotate the FUNCTION switch to PEAK. Do not change the CAL control setting.

STEP 4. Measure the peak value of the signal, using the procedure outlined in paragraph 1. 15. 3.

STEP 5. Note the meter reading and attenuator setting. Depending upon the signal input connections or devices used, compute the signal level by using one of the following procedures:

a) 50 Ohm Two-Terminal Broadband Noise Measurements. - To find the signal level at the INPUT terminals in db above 1 microvolt, add the meter reading in db to the attenuator setting in db. For example, if the meter reads 26 db and the ATTENUATOR setting is +40 db, the signal level is 26 + 40, or +66 db above 1 microvolt. To express this in broadband terms of db above 1 microvolt per kilocycle, subtract a correction factor in db corresponding to the receiver's impulse noise bandwidth in kc (see Chart 2).

b) High Impedance Two-Terminal Broadband Noise Measurements. - When the antenna coupler and adapter are used as signal input devices, the signal level at the input terminals of the adapter can be found as follows: add the meter reading in db, the ATTENUATOR setting in db, and the Antenna Coupler correction factor in db (determined from Chart 3). This gives the signal level in db above 1 microvolt. To express this in broadband terms of db above 1 microvolt per kilocycle, subtract a correction factor (in db) corresponding to the receiver's impulse noise bandwidth, (in kc), determined from Chart 2.

c) Rod or Loop Antenna Broadband Noise Measurements. - Add the meter reading in db, the ATTENUATOR setting in db, and the appropriate antenna correction factor in db to obtain the field intensity in db above 1 microvolt per meter. Correction factors for the Rod Antenna can be determined from Chart 3, and for the loop antenna from Chart 4. To express this in broadband terms of db above 1 microvolt per meter per kilocycle, subtract a correction factor in db corresponding to the receiver's impulse noise bandwidth, in kilocycles (see Chart 2).

Note. - To measure "Antenna Induced" broadband radiated interference when using the 41" rod antenna, add the meter reading in db, the Attenuator setting in db, and the Antenna Coupler correction factor in db (Not the Rod Antenna correction factor). Then, subtract from this sum a db factor corresponding to the receiver's impulse noise bandwidth (in kc). This expresses the "Antenna Induced" voltage in terms of db above 1 microvolt per kilocycle.

1.16 CALIBRATION DATA AND CHARTS

Calibration figures and correction factors for the Stoddart NM-22A RI-FI Measuring Equipment are given in the following pages. The charts listed below are supplied:

CHART 1. Calibration Figures, Two-Terminal 50 Ohm Input

CHART 2. Random and Impulse Noise Bandwidth and DB Correction Factors

CHART 3. Correction Factors, Two-Terminal High Impedance Input or Remote Rod Antenna

CHART 4. Correction Factors, Remote Loop Antenna

CHART 5. Correction Chart For Measuring Sinusoidal Signals in The Presence of High Level Ambient Interference

CHART 1

CALIBRATION FIGURES, DB

TWO-TERMINAL 50-OHM INPUT

FOR NM-22A, Serial No. SAMPLE ONLY

	BANDWIDTH SWITCH POSITION	
BAND	BROAD	NARROW
1	31.25	21.25
2	31.25	21.25
3	31.25	21.25
4	31.25	21.25
5	31.50	21.50
6	31.50	21.50
7	31.50	21.50
8	32.25	22.25

CHART 1, CALIBRATION FIGURES, TWO-TERMINAL 50-OHM INPUT

SAMPLE ONLY

CHART 2

RANDOM AND IMPULSE NOISE BANDWIDTH
AND DB CORRECTION FACTORS

For NM-22A Serial No. SAMPLE ONLY

A) For Broad Bandwidth Switch Position

RANDOM NOISE				IMPULSE NOISE	
BAND	BW, KC	$\sqrt{RNBW}$	FACTOR, DB	BW, KC	FACTOR, DB
1	7.45	2.73	8.7	10.83	20.7
2	7.42	2.72	8.7	10.78	20.6
3	7.46	2.72	8.7	10.85	20.7
4	7.45	2.73	8.7	10.83	20.7
5	7.49	2.74	8.7	10.89	20.7
6	7.39	2.72	8.7	10.72	20.6
7	7.49	2.74	8.7	10.89	20.7
8	7.49	2.74	8.7	10.89	20.7

B) For Narrow Bandwidth Switch Position

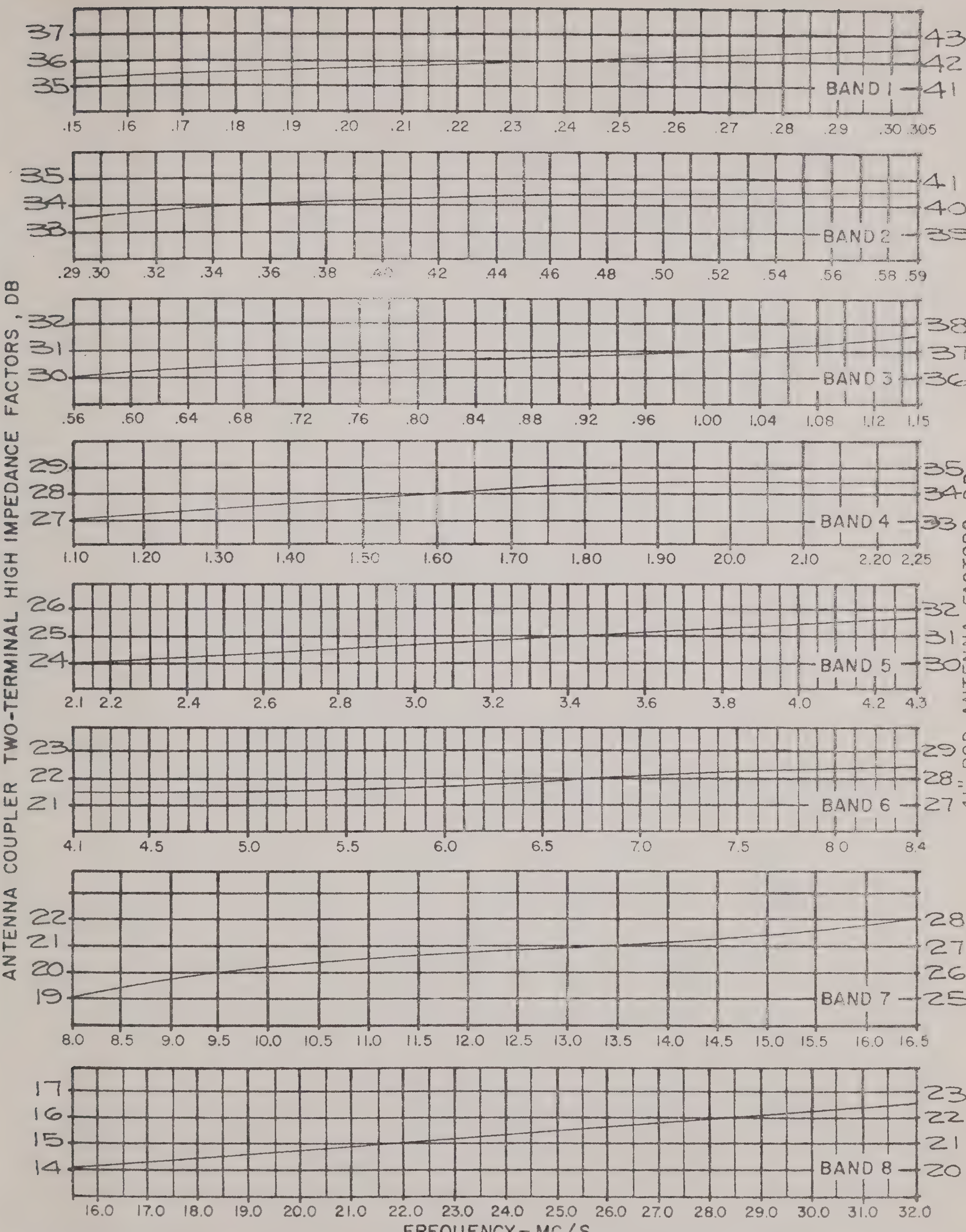
ON ALL BANDS: Random Noise BW = 2.085 KC

$\sqrt{RNBW}$ = 1.445

$\sqrt{RNBW}$ Factor in DB = 3.2

CHART 2, RANDOM AND IMPULSE NOISE BANDWIDTH AND
DB CORRECTION FACTORS

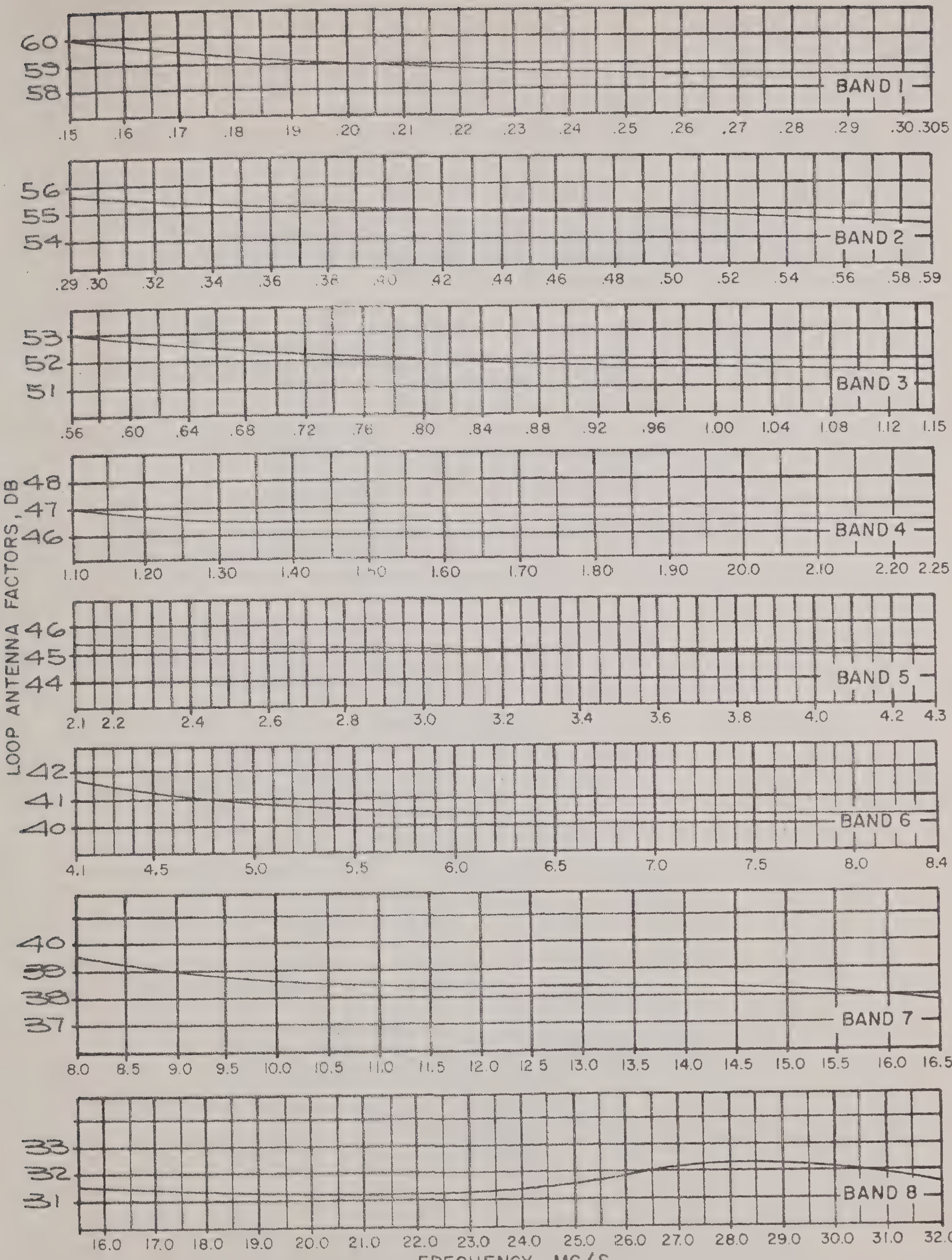
SAMPLE ONLY



CALIBRATED BY: ______________________ FOR S.A.R.CO. 92198-3 ANTENNA COUPLER

DATE: ______________ SERIAL NO. SAMPLE ONLY

CHART 3 — CORRECTION FACTORS, TWO-TERMINAL HIGH IMPEDANCE INPUT OR REMOTE ROD ANTENNA



CALIBRATED BY: ______________________ FOR S.A.R.CO. 92200-3 LOOP ANTENNA

DATE: ______________ SERIAL NO. SAMPLE ONLY

CHART 4 — CORRECTION FACTORS, REMOTE LOOP ANTENNA

CORRECTION CHART FOR SINE WAVE SIGNALS IN THE PRESENCE OF HIGH AMBIENT INTERFERENCE OF RANDOM NATURE

1 Adjust for standard gain at the frequency of the incoming "signal." Rotate **FUNCTION** switch to **FIELD INTENSITY.**

2. Note the meter reading of the interfering "noise" in the absence of sine wave signal. If necessary, detune slightly off signal.

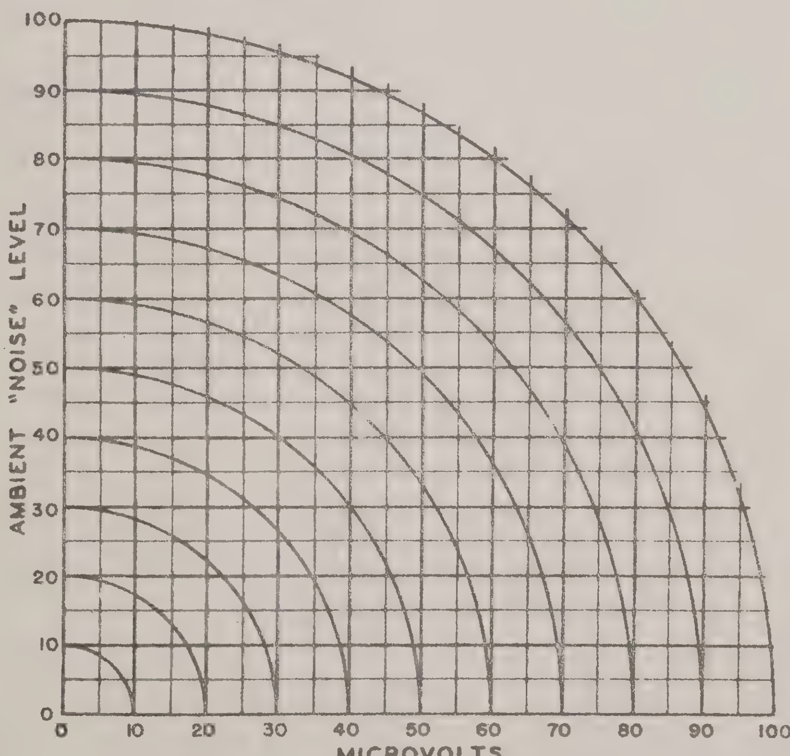
3. Tune signal for maximum meter reading and note reading of signal and interfering "noise" combined.

4. Locate the meter reading of "noise plus signal" on horizontal scale of chart.

5. Follow the arc upward until it intersects the horizontal line which represents the "noise only" meter reading.

6. Drop down from the point of intersection to the horizontal scale and read off the corrected meter reading.

7. This is the value of the sine wave signal in the absence of "noise."



SECTION II

TECHNICAL DESCRIPTION

2.1 INTRODUCTION

This section contains the electrical specifications and a circuit analysis of the STODDART NM-22A RI-FI Measuring Set. A complete set of schematic diagrams for the equipment is furnished in Section III (Maintenance).

2.2 ELECTRICAL SPECIFICATIONS

Frequency Range: 150 kc to 32 mc in eight bands

Sensitivity: The sensitivities in the following tables are based on a signal to noise ratio of unity (S/N=1). The data is related to the frequency, bandwidth and pickup device specified.

NARROWBAND SENSITIVITY (3 KC Bandwidth) (S/N = 1) (Sinewave Signals - FI Function)					
CONDUCTED				RADIATED	
50 OHM INPUT R. F.		HIGH Z INPUT		ROD ANTENNA (1/2 meter)	LOOP ANTENNA
μV	DB Related to 1μV	μV	DB Related to 1μV	μV/meter	μV/meter
.033 to .07	-30.0 to -23.0	2.5 to 0.5	8.0 to -6.0	5.0 to 1.0	40.0 to 5.0

BROADBAND SENSITIVITY (10 KC Bandwidth) (S/N = 1) (Impulse Signals - Peak Function)					
CONDUCTED				RADIATED	
50 OHM INPUT R. F.		HIGH Z INPUT		ROD ANTENNA (1/2 meter)	LOOP ANTENNA
μV/KC	DB Related to μV/KC	μV/KC	DB Related to 1μV/KC	μV/meter /KC	μV/meter /KC
0.01 to 0.02	-40.0 to -36.0	0.6 to 0.1	-4.0 to -20.0	1.2 to 0.2	10.0 to 0.6

Voltage Measurement Range. - The measurement range is 40db in the lowest attenuator position. An additional 100db attenuation is provided in 20db steps, resulting in a maximum voltage measurement capability of 140db.

RF Gain. - Constant within ± 3db over each band.

Voltage Measurement Accuracy. - Overall voltage measurement accuracy is within ± 2db.

Frequency Scale Accuracy. - True frequency is within ± 2% of the indicated frequency.

Input Impedance. - 50 ohms with VSWR maximum of 1.2 to 1 over the frequency range: BNC input connector.

Measurement Functions. - FIELD INTENSITY, QUASI-PEAK, SLIDEBACK PEAK and BFO.

Selectable 6 DB Bandwidths. - Approximately 3 and 10 kc; both constant over the frequency range.

Shielding Effectiveness. - Greater than 90db.

Spurious Response Rejection. - Image and IF greater than 60db. All other spurious, greater than 70db.

Oscillator Radiation. - Less than 100 picowatts across the 50 ohm input.

Overload Capacity. - 20db beyond full scale meter deflection.

Oscilloscope Output. - 2 volts, high impedance.

Audio Output. - 100 milliwatts into a 600 ohm resistive load.

1.6 mc IF Output. - Approximately 1 millivolt across a 50 ohm load at full scale meter deflection.

Y and Recorder Output. - 1.5 vdc across a 1500 ohm resistive load at full scale meter deflection. Output is proportional to meter deflection.

X Output. - 1.0 vdc for maximum dial rotation.

Calibration. - Internal impulse generator with fixed repetition rate of approximately 65 pps. Spectral output level is constant throughout the frequency range.

AC Power Requirements. -

Line Voltage:	Either 105 to 125 volts, or 210 to 250 volts. Measurement accuracy is not impaired by line voltage fluctuations within these ranges.
Line Frequency:	Single phase; 50-60 or 400 cps.
Power Consumption:	125 watts at 115 or 230 volts, 60 cps.

2.3 PHYSICAL DATA

2.3.1 <u>Dimensions.</u> - RI-FI Meter - 7-5/8" x 19-1/8" x 10-1/4"
Power Supply - 7-5/8" x 19-1/8" x 9-7/8"

2.3.2 <u>Weight.</u> - RI-FI Meter - 31-1/4 lbs.
Power Supply - 35 lbs.

2.4 ANALYSIS OF THE RI-FI METER

2.4.1 <u>RF Input Circuits.</u> - From the RF INPUT receptacle, J101, signals are applied to the RF attenuator, Z101. This assembly includes six attenuator networks assembled in cylindrical housings. The arrangement of resistive elements that constitute each attenuator network is that of a coaxial transmission line and the tubes form coaxial line sections. The housings are mounted around a shaft which is controlled by the front panel ATTENUATOR knob. As this knob is rotated to the desired position, the proper network is switched in series with the input signal. After passing through the attenuator, the signal is applied to the CAL switch, S101. This switch is linked mechanically with the FUNCTION selector. For any function except CAL, the impulse calibrator is disabled, and the signal is fed through S101 and the RF low pass filter, Z104, to the input of the RF tuner. For the CAL function, the RF input circuits are disabled, and the impulse calibrator signal is fed through S101 and Z104 to the tuner.

2.4.2 <u>RF Tuner, A101.</u> - This section includes a turret-type switching assembly, eight tuned circuit strips, an RF amplifier, and a mixer/oscillator.

The tuned circuit sections Z105 to Z112 are mounted around a shaft which is geared to the front panel BAND selector. As the BAND selector is rotated to the desired position, the tuned circuit strip corresponding to the selected band is switched into the tuner circuits. Each strip includes tuned circuits for the RF amplifier and mixer/oscillator stages. These circuits are tuned within the selected band by ganged variable capacitor C108, which is geared to the front panel TUNING control. The tuned circuits of the RF amplifier are resistor loaded, and are coupled in such a manner that the overall bandwidth is practically constant throughout the frequency range of the equipment. On bands 1 and 2, an RF low pass filter is placed in the mixer grid circuit to provide adequate rejection of image frequencies.

Signals delivered to the input of the tuner are amplified by RF amplifier V102, and then fed to the mixer/oscillator, V103. This tube is a dual triode with shielded sections. One section functions as the first local oscillator, and the other as the first mixer. On each band, the local oscillator frequency is higher than that of the RF input signal by an amount equal to the intermediate frequency. The intermediate frequency produced at the mixer output is 1.6 mc for bands 1, 2, 5, and 6, or 4.5 mc for bands 3, 4, 7, and 8. This output is fed into the IF Converter, Z113.

2.4.3 IF Converter, Z113. - For bands 1, 2, 5, and 6, single conversion is used and Z113 functions as a 1.6 mc IF amplifier. For the remaining bands, dual conversion is used and Z113 functions as a 4.5 mc/1.6 mc IF converter. The mode of operation of Z113 is controlled by cam-actuated switches S103 and S104. When the RF tuner is switched to a single conversion band, S103 and S104 allow the 1.6 mc IF to pass from the mixer output to a 1.6 mc tuned circuit at the input of Z113. For dual conversion bands, S103 and S104 route the 4.5 mc IF through a bandpass filter to the second mixer/oscillator, V104. This stage also uses a dual triode with shielded sections. One section functions as the second mixer, and the other as a 6.1 mc crystal controlled oscillator. The 1.6 mc IF developed at the output of V104 is coupled through a bandpass filter to the first IF amplifier, V105. From the output of V105, the amplified 1.6 mc IF signal is fed to the CAL control and IF attenuator, Z114.

2.4.4 CAL Control and IF Attenuator, Z114. - This section includes the CAL control (R180), the IF attenuator relay (K101), and the IF attenuator network.

The CAL control includes ganged potentiometers R180A and R180B, and fixed resistors R181 and R182. These components form a constant impedance bridge-T variable attenuator with an input and output impedance of 50 ohms. The control shaft of R180 is extended to the front panel, and labeled CAL. Rotating this CAL control varies the overall gain of the receiver by changing the level of the signal applied to the IF attenuator.

The IF attenuator provides the first step of attenuation (20 db), while the RF amplifiers operate at full gain. The network is placed in the circuit for all positions of the ATTENUATOR except X0.1 by the IF attenuator relay K101.

2.4.5 IF Amplifier and Detector, Z115. - After passing through the CAL control and IF attenuator section, Z114, the 1.6 mc IF signal is applied to the input of Z115. The receiver selectivity is controlled by the setting of the BANDWIDTH switch, S106. In the BROAD position, the IF signal is fed through equalizing resistor R190 to the input of the second IF amplifier, V106. When S106 is in the NARROW position, the IF signal is routed through crystal filter Z115 to the input of V106. The IF signal is then amplified by V106, V107, V108, and V109, and the output of V109 is fed to cathode follower V111. When the FUNCTION switch is in the BFO position, the AGC and metering circuits are disabled and the 1.601 mc output of the crystal controlled beat frequency oscillator, V112, is coupled by stray capacity into the grid circuit of V109. Signals present at the cathode of V111 are fed to the IF OUTPUT receptacle, J113, and to the second detector, V112.

2.4.6 Signal Weighting Circuits. - These circuits are located in the IF amplifier and Second Detector Assembly, Z115. The term "weighting" refers to specific charge and discharge time constants introduced into the second detector load circuits and the AGC circuits for the desired measurement function. The FI, QP, and PEAK functions provide identical RMS meter readings for unmodulated sine wave signals. Meter readings are different for these functions when modulated signals are measured.

a) Field Intensity Circuit:

With the FUNCTION switch in the FI position, a short R-C time constant is introduced into the detector load circuit. This allows the output to follow any modulation components that may be present on the RF signal envelope. The detector output to the AGC section is then filtered in such a manner that a meter reading proportional to the average RMS value of the RF signal envelope is obtained.

The time constant of the FI weighting circuit filter is determined by R217 and C260, and is approximately 600 milliseconds charge and discharge. The audio component is taken from divider network R220 and R221, and applied through C261 to the audio amplifier section.

b) Quasi-Peak Circuit:

In the QP function, the detector load time constants are approximately 1 millisecond charge and 600 milliseconds discharge. When measuring pulse signals having either a high repetition frequency or a pulse width that is long compared to the reciprocal of the receiver bandwidth, the meter reading approaches the peak value of the second detector output signal. Under these conditions, the ratio of the QP meter reading to the PEAK reading approaches unity. For pulses having a shorter duration or a lower repetition frequency, the ratio of the QP reading to the PEAK reading decreases.

Capacitor C260 is in both the charge and discharge networks of the detector load circuit. The charge path for C260 is through V112 and R216. The discharge path is through R217, R220 and R221.

The percentage of modulation can be determined by taking the ratio of the QP meter reading to the FI meter reading.

The shorter charge time constant of the QP function reduces the apparent meter response time, thereby enabling an operator to scan across a given band and observe signals more quickly than in the FI function.

c) Peak Circuits:

The PEAK function provides the standard slideback facility for measuring signals in terms of peak values. The front panel PEAK control varies a negative bias applied to R221 in the signal weighting circuits. Detector V112 operates as in the FI function.

When the FUNCTION selector is rotated to the PEAK position, the cutoff bias normally applied to the visual peak trigger stage V116 is reduced to a level that allows conduction. This permits normal operation of the visual peak indicator circuits and PEAK lamp.

d) BFO Position:

The circuit configuration is the same as for the FI function, except that the AGC circuit is grounded by S104-C. This allows the second and third IF amplifier stages to operate at maximum gain. The grid of V118 in the VTVM stage is grounded to disable the front panel meter. Switch S104 allows +225 volts dc to be applied to the beat frequency oscillator, V112.

e) CAL Position:

The weighting circuit connections are the same as for the QP position. In addition, S101 applies +225 volts dc to the multivibrator, V101, that drives the mercury switch Z102. The RF INPUT is disconnected, and the output of the impulse calibrator is applied to the input of the tuner.

2.4.7 VTVM and AVC Section. - The VTVM circuits include two triodes, V117 and V118, and the front panel meter, M101. The two triodes with plate resistors R273, R275, and potentiometer R274, form a balanced bridge with M101 connected across the balanced points. The weighted dc voltage, corresponding to the signal, is applied to the grid of V117. This unb alances the bridge, and causes the meter reading to deflect upscale and indicate the magnitude of the unbalance.

The weighted dc voltage is also applied as AVC to the IF amplifier section. This allows an approximately linear decibel scale to be included on the face of the front panel meter. For accurate meter tracking, the operating region of the gain controlled IF amplifier tubes can be adjusted with the meter tracking controls.

The ADJ ZERO control, R274, determines the plate voltage of V117 and V118, and is used to balance the bridge. The bridge is balanced when M101 reads zero with the FUNCTION switch in the BFO position.

The REMOTE METER and Y-OUTPUT, RECORDER jacks permit a remote meter and external recorder to be connected in series with M101. External units should each have a dc resistance of 1500 ohms to avoid changing the meter calibration.

CAUTION

The REMOTE METER and Y-OUTPUT, RECORDER jacks carry B+ potentials.

The total resistance of the VTVM plate circuit is approximately 4500 ohms. The response time of M101 can be changed from normal to slow by placing the METER FAST/SLOW switch, S109, in the SLOW position. This shunts capacitor C277 across the 4500 ohm meter circuit, thus increasing the response time to 2-3 seconds.

2.4.8 Visual Peak Indicator. - This section includes pulse amplifier V115, trigger stage V116, and the front panel PEAK lamp, I102. The visual peak circuits operate only in the PEAK function.

The demodulated output of the second detector is amplified by V113, and fed to pulse amplifier V115. The amplified signal pulses appearing at the plate of V115 are negative-swinging in polarity. These pulses are fed to the grid of the input section of trigger stage V116.

Trigger stage V116 is a one-shot multivibrator employing a dual-triode. The input triode normally conducts, but the output triode is held at cutoff by a negative bias applied to the grid through the PEAK SENS control, R264.

When a negative swinging pulse of sufficient amplitude is applied from V115 to the grid of the input triode, the tube is driven to cutoff and the output triode begins to conduct. The increasing plate current of the output triode fires the PEAK lamp, which then remains fired throughout the conduction period.

For all functions except PEAK, V116 is held in a stable condition by a negative bias applied to the grid of V115.

2.4.9 Audio Amplifiers. - The demodulated signal taken from the output of the second detector is amplified by V113 and fed to both the OSCILLOSCOPE jack, J114, and the audio amplifier, V114. Tube V113 is a broadband amplifier capable of passing any modulation components that may be present. The AUDIO control, R244, is located between the output of V113 and the input to V114. From the plate of V114, the amplified audio signal is coupled to the AUDIO OUTPUT jack, J115, by transformer T133.

2.5 ANALYSIS OF THE AC POWER SUPPLY

The AC Power Supply requires a single-phase AC source of either 105 to 125, or 210 to 250 volts, 50, 60, or 400 cycles per second. This unit is capable of delivering the following maximum outputs:

a) Regulated Plate Supply, 225 volts dc at 190 milliamperes.

b) Regulated Bias Supply, -105 volts dc at 30 milliamperes.

c) Filament Supply, 6.3 volts ac at 6.3 amperes.

Regulation is achieved by means of an electromagnetic servo system which controls the primary voltage of power transformer T301 to compensate for variations in DC output.

The POWER switch, S301, applies primary power from the POWER INPUT receptacle, J302, to line filter Z301. Overload protection is provided by line fuses F301 and F302. Filter Z301 and isolation transformer T302 prevent conducted interference on the power line from entering the RI-FI Meter and being measured as interference. They also prevent any interference generated in the power supply from entering the power line.

The line voltage selector, S302, permits operation from either a 115 volt or a 230 volt power source. This switch connects the two primary windings of isolation transformer T302 in parallel for 115 volts, or in series for 230 volts.

One lead of the secondary winding of T302 is connected directly to one lead of the primary winding of power transformer T301. The other lead of the secondary winding of T302 is connected to the primary winding of T301 through a parallel network consisting of R301 and an electromagnetic voltage regulator. The voltage regulator effectively varies the total resistance in parallel with R301 in such a manner as to compensate for changes in line voltage.

Resistors R302 through R310 constitute the resistance placed in parallel with R301 by the shunting action of the regulator's armature. The armature position is controlled by the current flowing through the solenoid of K301.

The amplification provided by V302 decreases the response time of the relay sensing circuit to improve regulation when 400 cps power lines are used. A clamp tube, V303, is used to prevent runaway during the warm-up period of V302. After V302 has reached its operating temperature, V303 extinguishes.

The current through the solenoid of K301 is determined by the rectified output voltage. An increase in line voltage causes an increase in the rectified output, and a corresponding increase in current through the solenoid. The solenoid then positions the armature to insert more resistance in series with the primary of T301. This increase in resistance causes the dc output to decrease to the proper value. When the line voltage decreases, this sequence of events is reversed.

Interference generated at the contacts is eliminated by L301, L303, C301, C302, C304, C310, and R316.

The reference potential at which the regulator must operate to provide a DC output of +225 volts is established by potentiometer R313. This control sets the operating point of V302.

The high voltage AC delivered by the secondary of T301 is rectified by a full wave bridge consisting of silicon diodes CR301, CR303, CR304, and CR305. Adequate filtering is provided by L304A and filter capacitors C305 and C306.

The AC voltage delivered by terminals 2 and 3 of T301 is rectified by CR302 to provide the -105 volt dc bias. This bias is filtered by C307 and L304B, and regulated by V301.

The secondary filament winding of transformer T301 (terminals 7 through 12) is connected in series with the low voltage secondary winding of transformer T302 (terminals 8 through 11). These windings are connected so that the unregulated voltage of T302 opposes the regulated voltage of T301. These two voltages are combined in the proper proportions by adjustable taps on the transformer windings. In this manner, improved filament regulation for the RI-FI Meter is obtained for line voltage changes from 105 to 125 volts. The voltages for the filament of V302 and for I301 are taken from different low voltage taps, since at the output of the power supply the filament voltage for the RI-FI Meter is slightly greater than 6.3 volts to compensate for cable losses.

Filament power for the RI-FI Meter is available at Pins A and E of J301. Pin A connects to terminal 8 on T302, and Pin E connects to terminal 9 on T301. Terminal 9 of T302 connects to terminal 7 of T301. This cross connection between T301 and T302 completes the filament circuit.

SECTION III

ALIGNMENT AND MAINTENANCE

3.1 TEST EQUIPMENT REQUIRED

The following test equipment was used by the manufacturer to align the RI-FI Meter. For best results, these or equivalent instruments should be used for maintenance:

(1) Signal Generator - Hewlett-Packard Type 606A.

(2) Vacuum Tube Voltmeter - Hewlett-Packard 410B.

(3) Volt-Ohmmeter - Any 20,000 ohms-per-volt instrument.

3.2 LOCATION AND DESCRIPTION OF METER SCALE TRACKING CONTROLS

Figures 3-1 and 3-2 show the physical location of the meter scale tracking controls and the adjustable IF coils. The meter scale tracking controls are described below:

CONTROL:	DESCRIPTION:
ADJUST ZERO	With the FUNCTION switch in the BFO position, this control is used to adjust the electrical zero of the front panel meter.
FI-1	With the FUNCTION switch in the FI position, this control is used to adjust meter scale tracking at the 1 microvolt gradation.
FI-100	With the FUNCTION switch in the FI position, this control is used to adjust meter scale tracking at the 100 microvolt (full scale) gradation.
PEAK-1	With the FUNCTION switch in the PEAK position, this control is used to adjust meter scale tracking at the 1 microvolt gradation.

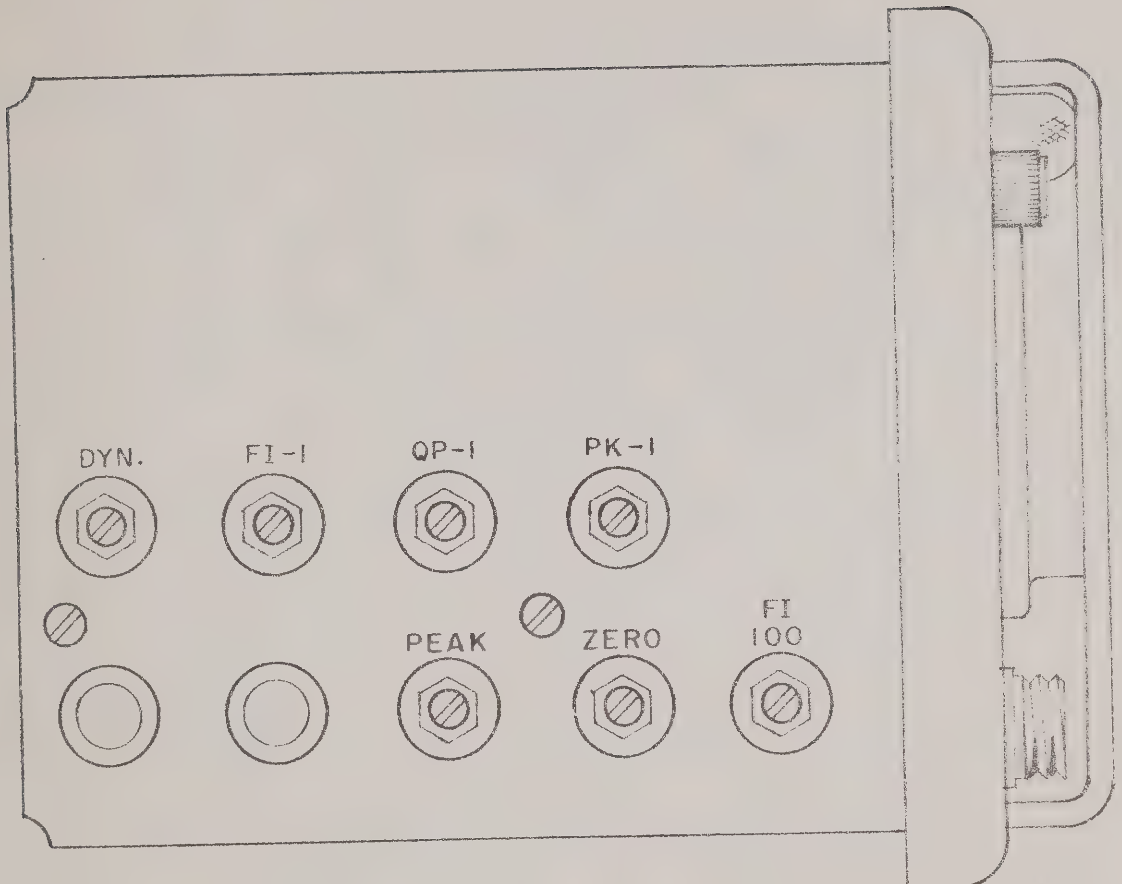


FIGURE 3-1, METER TRACKING ADJUSTMENTS
OF THE STODDART NM-22A

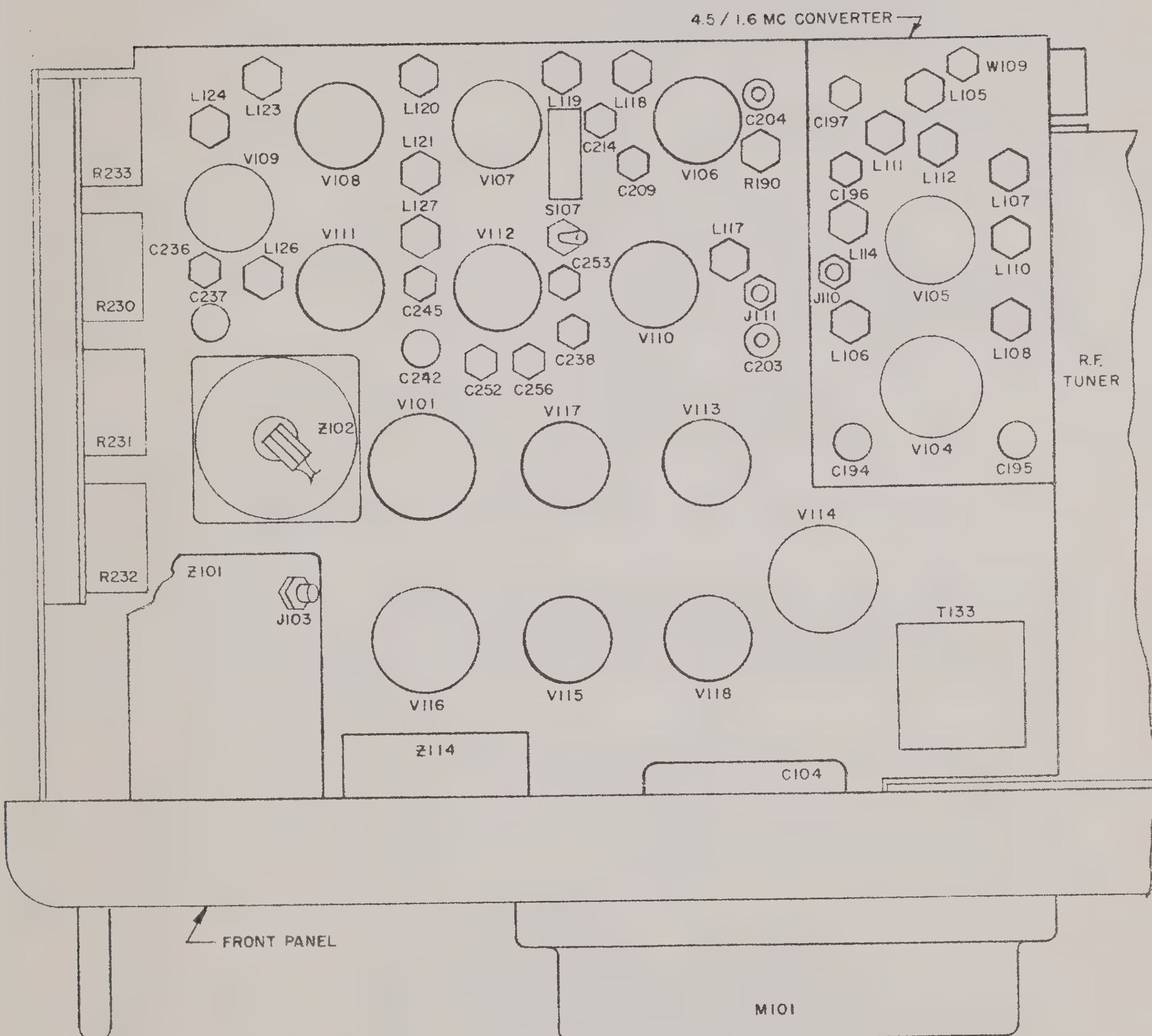


FIGURE 3-2, MAIN CHASSIS LAYOUT, TOP VIEW

CONTROL:	DESCRIPTION:
QP-1	With the FUNCTION switch in the QP position, this control is used to adjust meter scale tracking at the 1 microvolt gradation.
QP-100	With the FUNCTION switch in the QP position, this control is used to adjust meter scale tracking at the 100 microvolt gradation.
PEAK SENSITIVITY	With the FUNCTION switch in the CAL position, and the ATTENUATOR in X10, this control is used to adjust the trigger circuit, V116, for optimum sensitivity.
DYNAMIC RANGE	This control is used to adjust the overload capability of V109.

3.3 PREPARING THE EQUIPMENT FOR ALIGNMENT AND ADJUSTMENT

Before attempting alignment or adjustment of the equipment, check the mechanical zero of the front panel meter. If this is in need of adjustment, correcting the zero setting may eliminate the symptoms of trouble and allow the equipment to be returned to service. If the mechanical zero setting is correct, proceed as follows:

STEP 1. Remove the RI-FI Meter chassis from the case and place it on a bench or table.

STEP 2. Connect the RI-FI Meter to the AC Power Supply by means of Power Cable Assembly 91258-1 (6'6").

CAUTION

Check to see that line voltage selector S302 on the power supply chassis is set to the correct position for the power source to be used; also, make certain that the metal reminder tag on the front panel is properly set.

3.4 ALIGNMENT AND ADJUSTMENT PROCEDURES

3.4.1 Preliminary Checks. - Place POWER switch S301 in the ON position.

NOTE

Allow a one-hour warmup period before commencing alignment and adjustment procedures.

Check the following voltages at the points indicated:

1) B+ (+225 volts): Check at the RI-FI Meter POWER receptacle P101, pin B.

2) Bias Supply (-105 volts): Check at P101, pin C.

3) Filament supply (6. 0 volts AC): Check at P101, pin A.

3. 4. 2 Preliminary Meter Tracking Adjustments. - With no signal input, perform the following checks:

3. 4. 2. 1 Adjustment of Meter Electrical Zero:

STEP 1. Set FUNCTION switch S108 to the BFO position.

STEP 2. Set the ADJUST ZERO control R274 for a meter reading of zero microvolts.

3. 4. 2. 2 Check For Gas Current in VTVM Tubes V117 and V118:

STEP 1. Set the following operating controls to the positions indicated:

ATTENUATOR	-	+80 db
CAL Control	-	Fully counterclockwise
FUNCTION Switch	-	FIELD INTENSITY
OTHER Controls	-	Any position

STEP 2. Turn the FI-1 control, R230, fully counterclockwise. If the meter reading is less than zero, this indicates that gas is present in V117, V106 or V107. The gaseous tube should be located and replaced.

STEP 3. If V117, V106 or V107 are replaced in Step 2, repeat Paragraph 3. 4. 2. 1.

3. 4. 2. 3 Preliminary Adjustment of FI-1 and FI-100 Controls:

STEP 1. With no signal input, set the following operating controls as indicated:

ATTENUATOR	-	X10
FUNCTION switch	-	FIELD INTENSITY
CAL control	-	Fully counterclockwise
OTHER controls	-	Any position

STEP 2. Adjust the FI-1 control, R230, for approximately 1 percent (1/16 inch) meter deflection.

STEP 3. Set the FI-100 control, R228, to mid-position.

3.4.3 <u>Intermediate Frequency Alignment (1.6 megacycles).</u> -

a) Equipment configuration for IF amplifier alignment:

STEP 1. Disconnect P110 from J110. Connect a coaxial cable patch cord between P110 and the output of the signal generator.

STEP 2. Plug headphones into the AUDIO output receptacle, J115.

b) Alignment of 1.6 megacycle IF system:

STEP 1. Set the following operating controls as indicated:

ATTENUATOR	-	X0.1
FUNCTION	-	FIELD INTENSITY
BANDWIDTH	-	As called for
CAL control	-	Fully clockwise
AUDIO	-	Fully clockwise
OTHER controls	-	Any position

STEP 2. Adjust the signal generator frequency to exactly 1600 kilocycles. Maintain this frequency throughout the following steps.

STEP 3. Rotate the BANDWIDTH switch to NARROW. Adjust the output of the signal generator to obtain a reading in the upper portion of the meter scale.

STEP 4. Using an alignment tool, adjust IF inductors L117 through L121, L123, L124, and L126 for maximum indication on M101, readjusting the signal generator output level as needed to maintain an on-scale reading.

STEP 5. To align the Crystal Filter, Z115, adjust C204 and C205 for maximum output. Repeak L117.

STEP 6. Adjust the signal generator output level for exactly mid-scale deflection on M101. Then, rotate the BANDWIDTH switch to BROAD and adjust the equalizer potentiometer, R190, for exactly mid-scale deflection. This equalizes the IF gain for the BROAD and NARROW positions.

STEP 7. Rotate the FUNCTION selector to BFO. A beat note of about 1000 cps should be audible in the headphones.

3.4.4 Final Meter Tracking Adjustments. - Using the same equipment configuration as for IF alignment, perform the following adjustments:

3.4.4.1 Adjustment of the FI-100 and FI-1 Controls. -

STEP 1. Set the operating controls as indicated:

ATTENUATOR	- X0.1
FUNCTION	- FIELD INTENSITY
BANDWIDTH	- BROAD
CAL control	- As called for
OTHER controls	- Any position

STEP 2. With the signal generator frequency set to exactly 1600 kilocycles (unmodulated), adjust the output level to 1000 microvolts. Adjust the CAL control for an indication of 10 microvolts on M101.

STEP 3. Adjust the signal generator output to 10,000 microvolts. Adjust the FI-100 control, R228, for a reading of 100 microvolts on M101.

STEP 4. Adjust the signal generator output to 1000 microvolts. Adjust the CAL control for a reading of 10 microvolts on M101.

STEP 5. Repeat steps 2, 3 and 4 until no further adjustment of the FI-100 control is required.

STEP 6. Adjust the signal generator output to 100 microvolts. Adjust the FI-1 control, R230, for an indication of 1.0 microvolt on M101.

STEP 7. Adjust the signal generator output to 1000 microvolts. Adjust the CAL control for an indication of 10 microvolts on M101.

STEP 8. Repeat steps 6 and 7 until no further adjustment of the FI-1 control is required.

STEP 9. Repeat steps 3 and 4, and then 6 and 7, until no further adjustment of the FI-1 or FI-100 control is required.

STEP 10. Tighten the locknuts on R228 and R230.

3.4.4.2 Adjustment of QP-100 and QP-1 Controls. -

STEP 1. Set the following operating controls as indicated:

ATTENUATOR	-	X0.1
FUNCTION	-	QP
BANDWIDTH	-	BROAD
CAL	-	As called for
OTHER Controls	-	Any position

STEP 2. Set the signal generator to deliver an unmodulated 1600 kc output with an amplitude of 1000 microvolts. Adjust the CAL control for a reading of 10 microvolts on the front panel meter.

STEP 3. Change the output level of the signal generator to 10,000 microvolts. Adjust the QP-100 control, R238, for a reading of 100 microvolts on the front panel meter.

STEP 4. Change the output level of the signal generator to 1000 microvolts. Re-adjust the CAL control for a reading of 10 microvolts on the front panel meter.

STEP 5. Repeat Steps 2, 3 and 4 until no further adjustment of the QP-100 control is required.

STEP 6. Set the output level of the signal generator to 100 microvolts. Adjust the QP-1 control, R231, for a reading of 1 microvolt on the front panel meter.

STEP 7. Change the output level of the signal generator to 1000 microvolts. Adjust the CAL control for a reading of 10 microvolts on the front panel meter.

STEP 8. Repeat Steps 6 and 7 until no further adjustment of the QP-1 control is necessary.

STEP 9. Repeat (a) Steps 2, 3 and 4, and (b) Steps 6 and 7 until no further adjustment of the QP-100 or QP-1 controls is necessary.

STEP 10. Tighten the locknuts on R231 (QP-1) and R238 (QP-100).

3.4.4.3 Adjustment of the PEAK-1 Control. -

STEP 1. Set the following operating controls as indicated:

ATTENUATOR	-	X0.1
FUNCTION	-	As called for
BANDWIDTH	-	BROAD
PEAK control	-	As called for
CAL control	-	As called for
*AUDIO control	-	1/4 clockwise
OTHER control	-	Any position

STEP 2. Set the FUNCTION switch to FIELD INTENSITY. Set the signal generator to provide an unmodulated 1600 kilocycle signal of 100 microvolts. Adjust the CAL control for an indication of 1 microvolt on M101.

STEP 3. Adjust the signal generator to modulate the 1600 kilocycle signal at less than 4% with a 1000 cycle note. Set the FUNCTION switch to PEAK. Adjust the front panel PEAK control, R236, to the point where the 1000 cycle signal just becomes inaudible.

STEP 4. If the reading on M101 is not 1.0 microvolt, correct by adjusting the front panel PEAK control. Then, adjust the PEAK-1 control, R232, to a position where the 1000 cycle signal just becomes inaudible.

STEP 5. Tighten the locknut on R232.

3.4.4.4 Adjustment of Dynamic Range (overload capability). -

STEP 1. With no signal input, set the following controls as indicated:

ATTENUATOR	-	X0.1
FUNCTION switch	-	PEAK
BANDWIDTH	-	BROAD
PEAK	-	As called for
CAL control	-	As called for
OTHER controls	-	Any position

STEP 2. Connect a high impedance (100 megohms or greater) vacuum tube voltmeter between the chassis and the above-chassis terminal of C253. The potential at this

* The Visual null indicating circuit can be used instead of the aural method.

terminal will be negative with respect to the chassis. Adjust the PEAK control for a reading of 100 microvolts on M101. Do not change the PEAK control setting for the remainder of this procedure. Note the voltage reading on the external VTVM.

NOTE

The reading on the external VTVM should be less than 4 volts. If more, it may be difficult to adjust the dynamic range to 20 db. Possible causes of a high reading could be improper adjustment of the FI-1 and FI-100 controls, or low sensitivity in the metering section of the RI-FI Meter.

STEP 3. Turn the equipment power off. Disconnect all wires from the C214 terminal which extends above the chassis, and solder or clip these wires together. Connect a jumper lead from the above-chassis terminal of C214 to the negative side of C259. Energize the equipment and rotate the FUNCTION switch to FIELD INTENSITY.

STEP 4. Adjust the signal generator output to 1000 microvolts at 1600 kilocycles. Adjust the CAL control for the same VTVM reading noted in Step 2.

STEP 5. Increase the signal generator output by 20 db (10 times, or to 10,000 microvolts). Adjust L127 for a maximum VTVM reading. This reading should be 9 times the original reading (10 percent down from linearity) for a dynamic range of 20 db. FOR EXAMPLE: If an input of 1000 microvolts results in 4 volts output, then with 10,000 microvolts input the output should be 9 x 4 = 36 volts. If the VTVM reading is low, adjust the Dynamic Range control R233 clockwise; if the reading is high, adjust counterclockwise. Repeat Steps 4 and 5 until no further adjustment is required.

STEP 6. Restore all circuits to their original condition.

STEP 7. Tighten the locknut on R233.

3.4.4.5 IF Attenuator Check. -

STEP 1. Set the following operating controls as indicated:

ATTENUATOR - As called for

FUNCTION	-	FIELD INTENSITY
BANDWIDTH	-	BROAD
CAL control	-	As called for
OTHER controls	-	Any position

STEP 2. Set the ATTENUATOR to X0.1. Set the signal generator to deliver an unmodulated 1600 kilocycle signal of 1000 microvolts. Adjust the CAL control for a meter reading of 100 microvolts.

STEP 3. Set the ATTENUATOR to X1. Set the signal generator output level to 10,000 microvolts. The reading on M101 should be 100 microvolts. If not, check the operation of K101 and S102, and check R183 to R185.

STEP 4. Remove the coaxial cable patch cord from P110. Connect P110 to J110.

3.4.5 Adjustment of Peak Sensitivity Control. -

STEP 1. Set the following operating controls as indicated:

ATTENUATOR	-	X1
FUNCTION	-	PEAK
BANDWIDTH	-	BROAD
CAL control	-	Fully counterclockwise
OTHER controls	-	Any position

STEP 2. With no signal input, adjust the PEAK SENSITIVITY control R264 in a clockwise direction until the PEAK lamp flashes.

STEP 3. Rotate the PEAK SENSITIVITY control counterclockwise until the PEAK lamp just ceases to flash. Adjust another 5° in the same direction.

STEP 4. Tighten the locknut on R264.

3.4.6 Alignment of 4.5/1.6 Megacycle Converter. -

STEP 1. Set the operating controls to the following positions:

ATTENUATOR	-	X0.1
FUNCTION	-	FI
BAND selector	-	As called for
TUNING DIAL	-	As called for
CAL control	-	1/2 maximum clockwise
BANDWIDTH	-	NARROW
OTHER controls	-	Any position

STEP 2. Connect the output of the signal generator through a .01 mfd capacitor to the grid (pin 7) of V103 (the first mixer).

STEP 3. Rotate the BAND selector to Band 2 (single conversion). Energize the equipment and allow a one hour warmup period.

STEP 4. Adjust the signal generator frequency to 1.6 megacycles and set the output level for mid-scale deflection on M101.

STEP 5. Adjust the 1.6 mc IF inductors L114, L112, L111, and L105 for maximum output on M101. Reduce the output of the signal generator as necessary to maintain an on-scale meter reading.

STEP 6. Rotate the BAND selector to Band 3 (dual conversion). Adjust the signal generator frequency to 4.5 megacycles and set the output level for mid-scale deflection on M101.

STEP 7. Adjust the 4.5 mc IF indicators L108, L110, and L107 for maximum output on M101. Reduce the output of the signal generator as necessary to maintain an on-scale meter reading.

STEP 8. Peak the reading on M101 by adjusting L106.

STEP 9. Restore the equipment to normal configuration.

3.4.7 Alignment of RF Circuits. - The RF tuned circuits of a given band may be in need of alignment if any of the following conditions are noted:

1) The calibration of the tuning dial is in error by more than 2 percent.

2) The sensitivity in certain sections of the tuning range is so low that the equipment cannot be calibrated.

The following procedure can be used to align any one of the eight bands. The adjustments for both the low and high frequency ends of each band can be determined from Table 3-1.

STEP 1. Allow the RI-FI meter to warm up for one hour in the equipment case, to bring all components up to normal operating temperature. Then, remove the RI-FI meter from the case, and remove the cover from the RF Tuner. The tuner cover has no effect on the adjustments, and may be left off during alignment.

STEP 2. Set the RI-FI Meter controls as follows:

ATTENUATOR	-	To X0.1
BAND	-	To the band being aligned
TUNING	-	As shown in Table 3-1
FUNCTION	-	To FIELD INTENSITY
BANDWIDTH	-	NARROW

STEP 3. Adjust CAL control for a reading of approximately 1 microvolt on M101.

STEP 4. Connect the signal generator to J101. Tune the receiver and the signal generator to the lowest calibrated frequency in the band (for example, 150 kc in Band 1). Set the output level of the generator for mid-scale deflection on M101.

NOTE

If the local oscillator is seriously out of alignment, it may be necessary to vary the signal generator frequency slightly to obtain a meter response. The final adjustment should be made at the frequency indicated in Table 3-1.

STEP 5. Adjust the local oscillator transformer for maximum output on M101.

STEP 6. Adjust the RF transformers and inductors for maximum output on M101. Readjust the signal generator output as necessary.

STEP 7. Set the TUNING dial to the highest calibrated frequency in the band (for example, 305 kc in Band 1). In the absence of an input signal, re-adjust the CAL control for a reading of approximately 1 microvolt on M101.

STEP 8. Tune the signal generator to the receiver frequency. Use an unmodulated output at a level high enough to cause mid-scale deflection on M101.

STEP 9. Adjust the oscillator trimmer capacitor for a maximum meter reading.

STEP 10. Adjust the RF trimmer capacitors for a maximum meter reading. Reduce the signal generator output as necessary to maintain an on-scale reading.

STEP 11. Repeat Steps 1 through 10 until no further adjustments are required.

TABLE 3-1 - RF TUNER ADJUSTMENTS

BAND	REF. DESIG.	FREQ. mc	ALIGNMENT ADJUSTMENTS L. O.	Mixer	RF Amplifier Plate	RF Amplifier Grid
1	Z105	.150 .305	T104 C131	* LPF	T102 C125	T101 C124
2	Z106	.290 .590	T108 C139	* LPF	T106 C133	T105 C132
3	Z107	.560 1.15	T112 C146	T111 C143	T110 C141	T109 C140
4	Z108	1.10 2.25	T116 C152	T115 C149	T114 C148	T113 C147
5	Z109	2.1 4.3	T120 C157	T119 C155	T118 C154	T117 C153
6	Z110	4.1 8.4	T124 C162	T123 C160	T122 C159	T121 C158
7	Z111	8.0 16.5	T128 C167	T127 C165	T126 C164	T125 C163
8	Z112	15.5 32.0	T132 C172	T131 C170	T130 C169	T129 C168

* See Paragraph 3.4.8 for adjustment of Low Pass Filters.

3.4.8 Alignment of RF Low Pass Filters, Bands 1 and 2. -

STEP 1. Set the BAND selector to Band 1 and the TUNING control to 305 kc (high end of Band 1).

STEP 2. Adjust the signal generator frequency to 1.6 mc and set the output level for mid-scale deflection on M101. This will require a signal generator output much higher than normal.

STEP 3. Adjust L103 for a minimum reading on M101. Readjust the signal generator output level if necessary.

STEP 4. Change the BAND selector to Band 2, so that the tuning dial indicates 590 kc (high end of Band 2).

STEP 5. Adjust the signal generator output (1. 6 mc) level for mid-scale deflection on M101.

STEP 6. Adjust L104 for a minimum reading on M101.

STEP 7. Replace the cover on the RF tuner and restore the equipment to its normal configuration.

3.4.9 Tube Complement and Operating Voltages. - The vacuum tube complement of the STODDART NM-22A is shown in Table 3-2. Operating voltages for these tubes are given in Table 3-3. These voltages were recorded by the manufacturer under the following conditions:

1) All voltage measurements were made using a chassis ground (except for filament of V302).

2) All DC voltages except those marked * were measured with a 20,000 ohm per volt meter.

3) Voltages marked * were measured with a Hewlett-Packard 410B DC VTVM.

4) All panel controls were rotated fully clockwise.

5) The BAND switch was placed in the Band 4 position.

6) The ATTENUATOR was placed in the 0 db position.

TABLE 3-2 - VACUUM TUBE COMPLEMENT

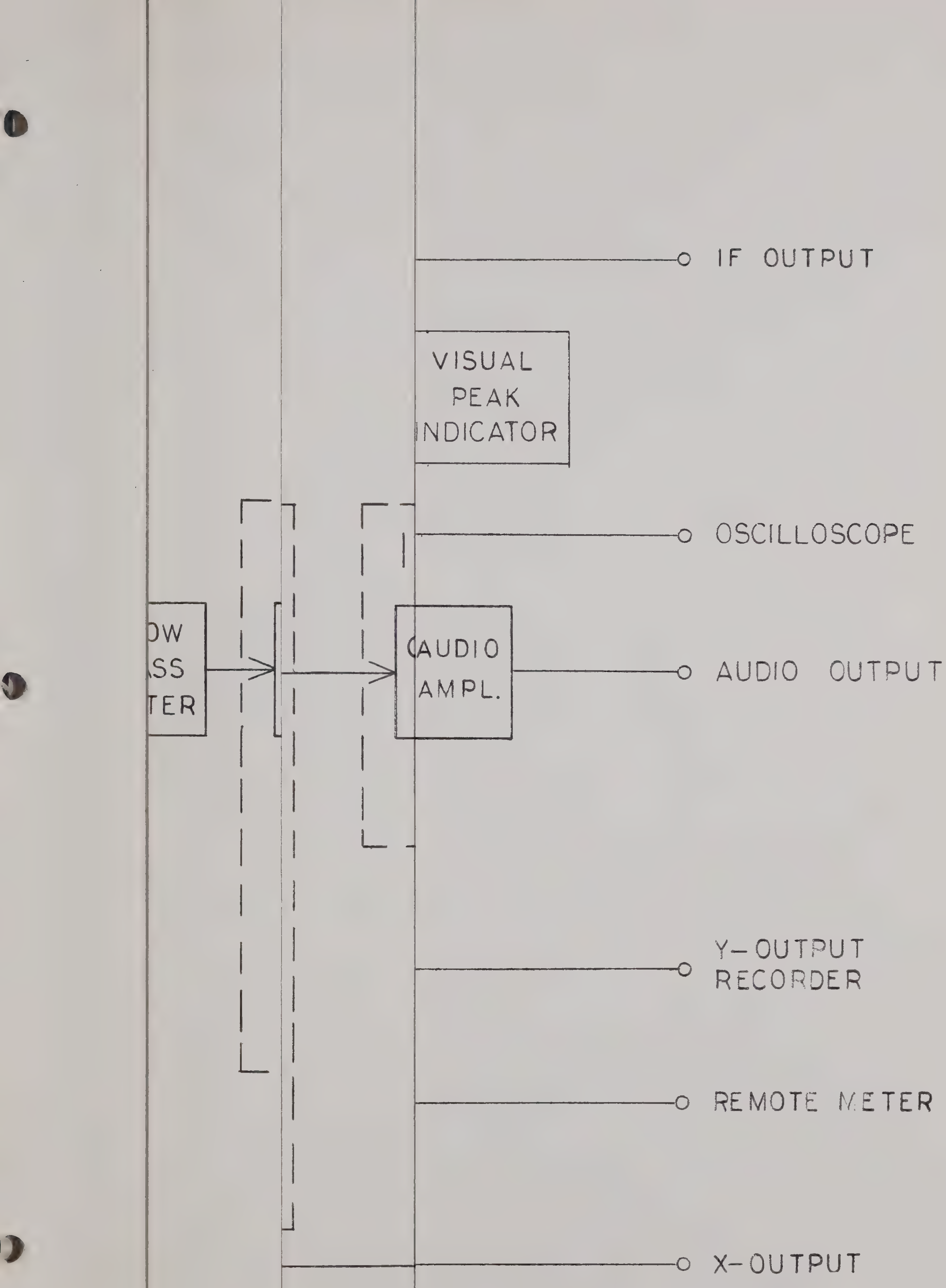
UNIT	NUMBER OF TUBES AND TYPE INDICATED								
	5814 A	6688	5670	6136/ 6AU6 WA	6005	5726	6100/ 6C4 WA	OB2 WA	Total
RI-FI METER	3	1	2	7		1	4		18
AC POWER SUPPLY					1			2	3
TOTAL NUMBER OF EACH TYPE	3	1	2	7	1	1	4	2	21

TABLE 3-3 STODDART NM-22A, VACUUM TUBE OPERATING VOLTAGES

TUBE	TYPE AND FUNC.	FUNCTION SWITCH POSITION	PLATE	SCREEN	SUP-PRESSOR	CATHODE	GRID	HEATER (A. C.)
V101	5814A Timing Mult.	CAL	P1 + 78 P6 + 195	- - - - - - - -	- - - - - - - -	P3 - 65 P8 - 35	P2 - 80 P7 - 65	P4 6.1
V102	USN/6688A RF Amp.	FI	P7 + 185	P9 + 152	P8 0	P1, P3 + 1.3	P2 0	P4 5.9
V103	5670 1st Mixer Osc.	FI	P6 + 34 P4 + 115	- - - - - - - -	- - - - - - - -	P8 + 0.9 P2 0	P7 - 0.8 P3 - 1.5	P9 6.0
V104	5670 2nd Mixer Osc.	FI Bands 3, 4, 7 and 8	P4 + 124 P6 + 98	- - - - - - - -	- - - - - - - -	P2 + 3.9 P8 + 3.9	P3 0 P7 - - -	P9 5.9
V105	6AU6WA 1st IF	FI	P5 + 210	P6 + 98	P2 0	P7 + 1.4	P1 0	P4 5.9
V106	6AU6WA 2nd IF	FI QP PK BFO	P5 + 222 P5 + 222 P5 + 222 P5 + 222	P6 + 66 P6 + 66 P6 + 66 P6 + 66	P2 0 P2 0 P2 0 P2 0	P7 + 1.3 P7 + 1.3 P7 + 1.3 P7 + 1.3	P1 - - - P1 - - - P1 - - - P1 - - -	P4 5.9
V107	6AU6WA 3rd IF	FI QP PK BFO	P5 + 222 P5 + 222 P5 + 222 P5 + 222	P6 + 66 P6 + 66 P6 + 66 P6 + 66	P2 0 P2 0 P2 0 P2 0	P7 + 1.3 P7 + 1.3 P7 + 1.3 P7 + 1.3	P1 - - - P1 - - - P1 - - - P1 - - -	P3 5.9
V108	6AU6WA 4th IF	FI	P5 + 222	P6 + 90	P2 0	P7 + 1.8	P1 0	P3 5.9
V109	6AU6WA 5th IF	FI	P5 + 220	P6 + 130	P2 0	P7 + 1.0	P1 0	P3 5.9
V110	6C4WA BFO	BFO	P1, P5 + 78	- - - -	- - - -	P7 + 2.5	P6 - - -	P3 6.0
V111	6C4WA 6th IF	FI	P1, P5 + 220	- - - -	- - - -	P7 + 84	*P6 + 14	Pc 6.0
V112	6AL5W	FI QP	P5, P1 + 0.4 P5, P1 + 0.9	- - - - - - - -	- - - - - - - -	P2 - 0.1 P7 - 0.05 0 0	- - - - - - - -	P3 6.0

TABLE 3-3 STODDART NM-22A OPERATING VOLTAGES (Continued)

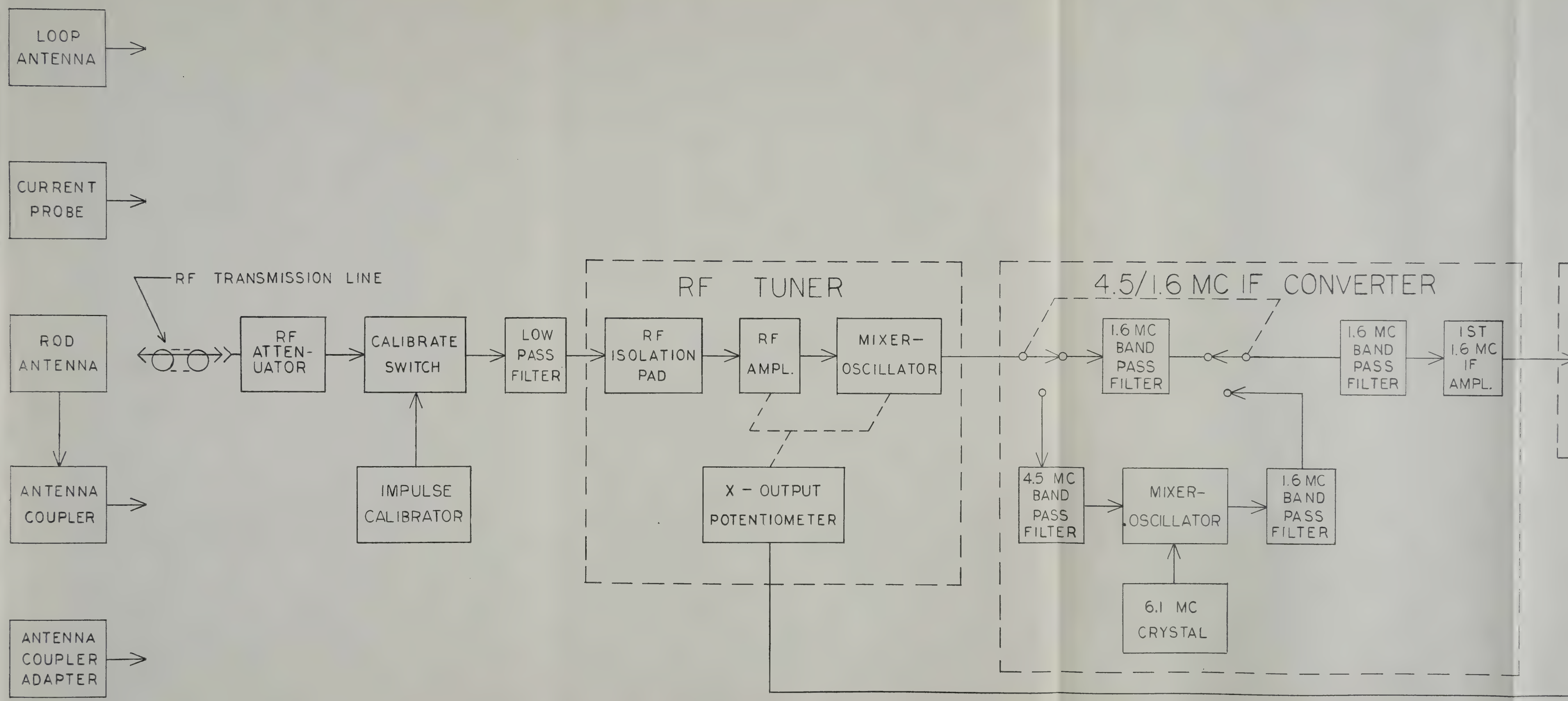
TUBE	TYPE AND FUNC.	FUNCTION SWITCH POSITION	PLATE	SCREEN	SUP-PRESSOR	CATHODE	GRID	HEATER (A.C.)
V112 Cont.	Det.	PK	P5, P1 + 1.0	- - - -	- - - -	0 0		
		BFO	P5, P1 + 0.4	- - - -	- - - -	-7.0 -7.0		
V113	6AU6WA 1st Audio	FI	P5 + 136	P6 + 136	P2 0	P7 + 3.3	P1 0	P4 6.0
V114	5814A Audio	FI	P1 + 159	- - - -	- - - -	P3 + 6.5	P2 0	P4 6.0
			P6 + 218	- - - -	- - - -	P8 + 7.5	P7 0	
V115	6AU6WA Pulse Amp.	PK	P5 + 28	P6 + 62	P2 0	P7 0	*P1 - 1.0	P4 6.0
V116	5814A Multiv.	PK	P6 + 52	- - - -	- - - -	P8 + 26	*P7 + 26.0	P4 6.0
			P1 + 175	- - - -	- - - -	P3 + 26	*P2 + 12.5	P4 6.0
V117	6C4WA VTVM	FI	P1 + 110	- - - -	- - - -	P7 + 3.4	P6 0	P4 6.0
V118	6C4WA VTVM	FI	P1 + 110	- - - -	- - - -	P7 + 3.4	P6 0	P4 6.0
V301	OB2WA -105 Reference	ANY	P1 0	- - - -	- - - -	P2, P4, P7 -107	- - - -	- - - -
V302	60005/ 6AQ5 DC Amp	ANY	P5 + 78	P6 + 229	- - - -	P2 0	P1, P7 -25	P3, P4 5.5
V303	OB2WA -105 Limiter	ANY	P1, P5 + 105	- - - -	- - - -	P2, P4, P7 0	- - - -	- - - -



PLIFIED BLOCK DIAGRAM
2A RFI METER

TABLE 3-3 STODDART NM-22A OPERATING VOLTAGES (Continued)

TUBE	TYPE AND FUNC.	FUNCTION SWITCH POSITION	PLATE	SCREEN	SUP-PRESSOR	CATHODE	GRID	HEATER (A. C.)
V112 Cont.	Det.	PK BFO	P5, P1 + 1.0 P5, P1 + 0.4	- - - - - - - -	- - - - - - - -	0 0 -7.0 -7.0		
V113	6AU6WA 1st Audio	FI	P5 + 136	P6 + 136	P2 0	P7 + 3.3	P1 0	P4 6.0
V114	5814A Audio	FI	P1 + 159 P6 + 218	- - - - - - - -	- - - - - - - -	P3 + 6.5 P8 + 7.5	P2 0 P7 0	P4 6.0
V115	6AU6WA Pulse Amp.	PK	P5 + 28	P6 + 62	P2 0	P7 0	*P1 - 1.0	P4 6.0
V116	5814A Multiv.	PK	P6 + 52 P1 + 175	- - - - - - - -	- - - - - - - -	P8 + 26 P3 + 26	*P7 + 26.0 *P2 + 12.5	P4 6.0 P4 6.0
V117	6C4WA VTVM	FI	P1 + 110	- - - -	- - - -	P7 + 3.4	P6 0	P4 6.0
V118	6C4WA VTVM	FI	P1 + 110	- - - -	- - - -	P7 + 3.4	P6 0	P4 6.0
V301	OB2WA -105 Reference	ANY	P1 0	- - - -	- - - -	P2, P4, P7 -107	- - - -	- - - -
V302	60005/ 6AQ5 DC Amp	ANY	P5 + 78	P6 + 229	- - - -	P2 0	P1, P7 -25	P3, P4 5.5
V303	OB2WA -105 Limiter	ANY	P1, P5 + 105	- - - -	- - - -	P2, P4, P7 0	- - - -	- - - -


LOOP ANTENNA
CURRENT PROBE
RF TRANSMISSION LINE
ROD ANTENNA
ANTENNA COUPLER
ANTENNA COUPLER ADAPTER
RF ATTEN-UATOR
CALIBRATE SWITCH
IMPULSE CALIBRATOR
LOW PASS FILTER
RF TUNER
RF ISOLATION PAD
RF AMPL.
MIXER-OSCILLATOR
X - OUTPUT POTENTIOMETER
4.5/1.6 MC IF CONVERTER
1.6 MC BAND PASS FILTER
4.5 MC BAND PASS FILTER
MIXER-OSCILLATOR
1.6 MC BAND PASS FILTER
6.1 MC CRYSTAL
1.6 MC BAND PASS FILTER
1ST 1.6 MC IF AMPL.

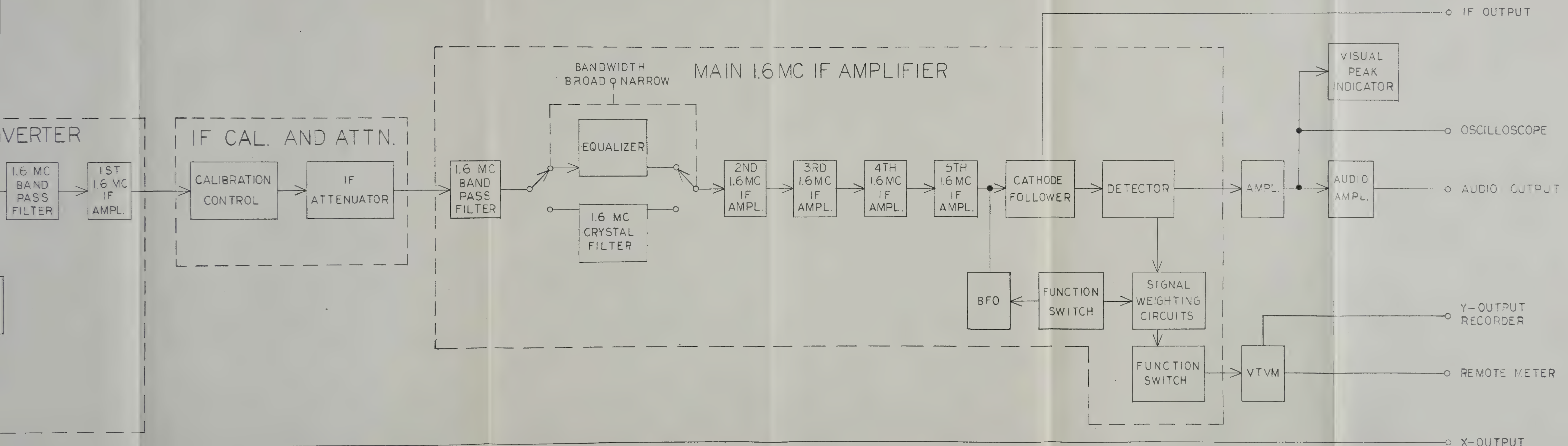
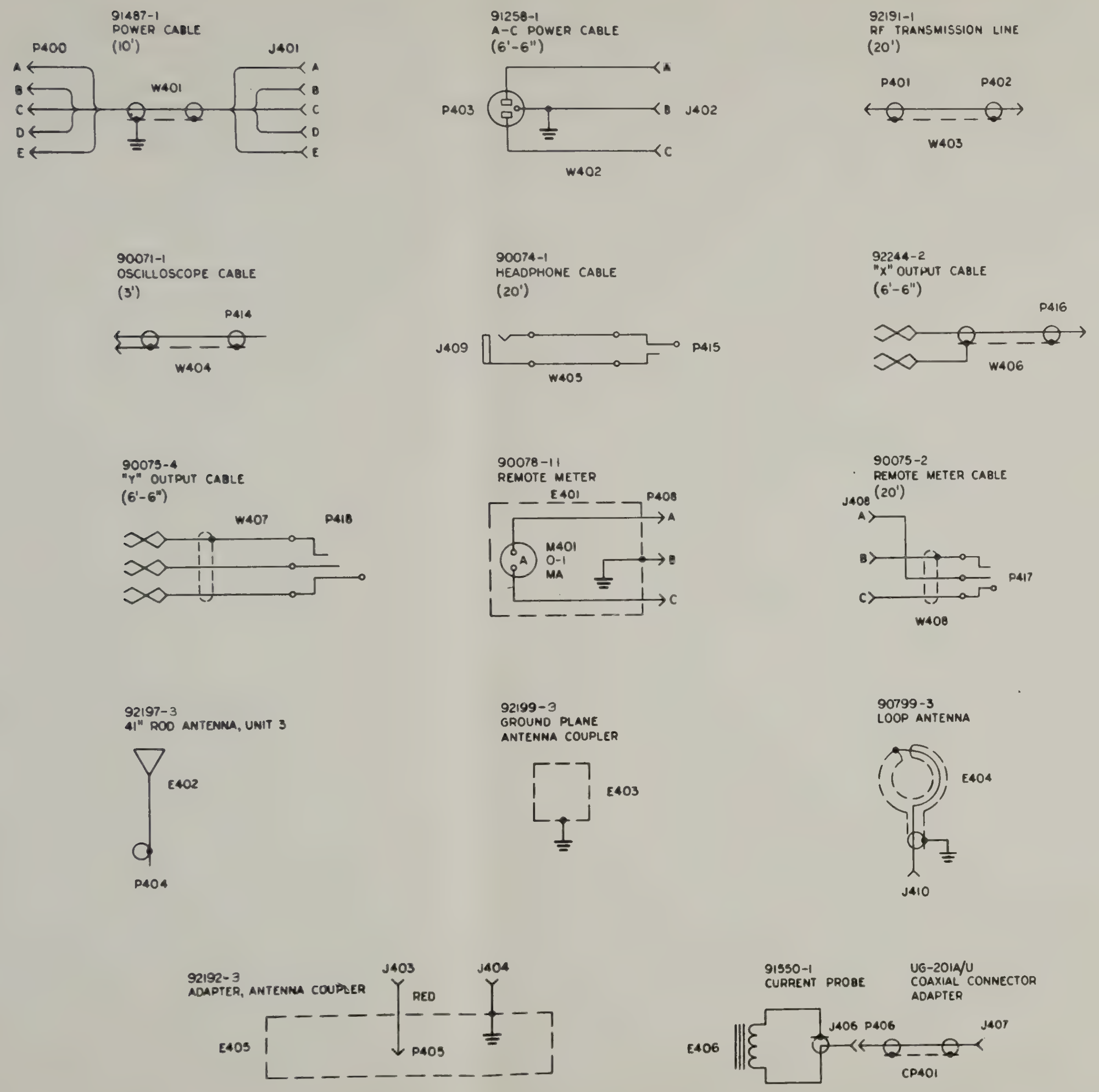
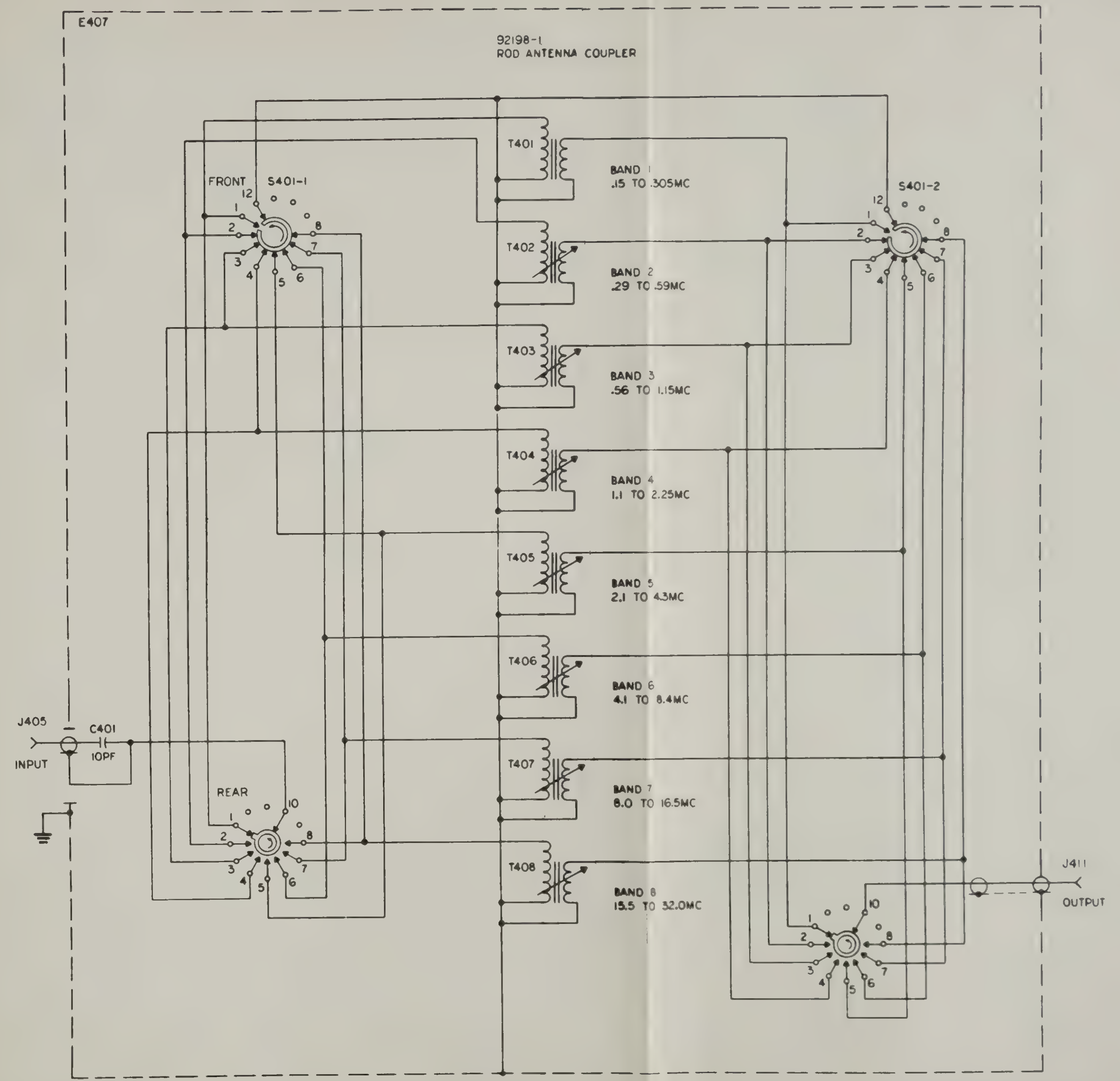


FIGURE 3-3, SIMPLIFIED BLOCK DIAGRAM
STODDART NM-22A RFI METER


91487-1
POWER CABLE
(10')
P400
J401
W401
A
B
C
D
E
91258-1
A-C POWER CABLE
(6'-6")
P403
J402
W402
92191-1
RF TRANSMISSION LINE
(20')
P401
P402
W403
90071-1
OSCILLOSCOPE CABLE
(3')
P414
W404
90074-1
HEADPHONE CABLE
(20')
J409
P415
W405
92244-2
"X" OUTPUT CABLE
(6'-6")
P416
W406
90075-4
"Y" OUTPUT CABLE
(6'-6")
W407
P418
90078-11
REMOTE METER
E401
P408
M401
0-1
MA
90075-2
REMOTE METER CABLE
(20')
J408
P417
W408
92197-3
41" ROD ANTENNA, UNIT 3
E402
P404
92199-3
GROUND PLANE
ANTENNA COUPLER
E403
90799-3
LOOP ANTENNA
E404
J410
92192-3
ADAPTER, ANTENNA COUPLER
J403
J404
RED
E405
P405
91550-1
CURRENT PROBE
UG-201A/U
COAXIAL CONNECTOR
ADAPTER
E406
J406
P406
J407
CP401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92198-1
ROD ANTENNA COUPLER
FRONT
S401-1
S401-2
REAR
T401
T402
T403
T404
T405
T406
T407
T408
BAND 1
.15 TO .305MC
BAND 2
.29 TO .59MC
BAND 3
.56 TO 1.15MC
BAND 4
1.1 TO 2.25MC
BAND 5
2.1 TO 4.3MC
BAND 6
4.1 TO 8.4MC
BAND 7
8.0 TO 16.5MC
BAND 8
15.5 TO 32.0MC
J405
INPUT
C401
10PF
J411
OUTPUT


E408

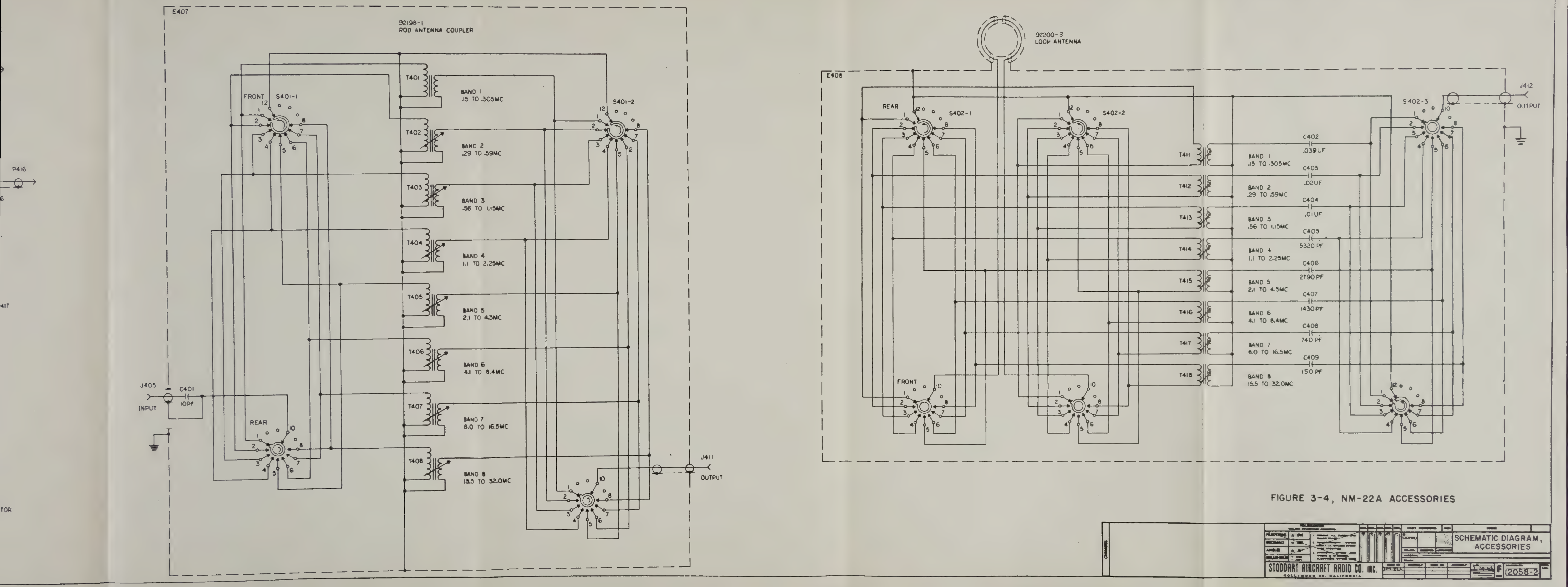
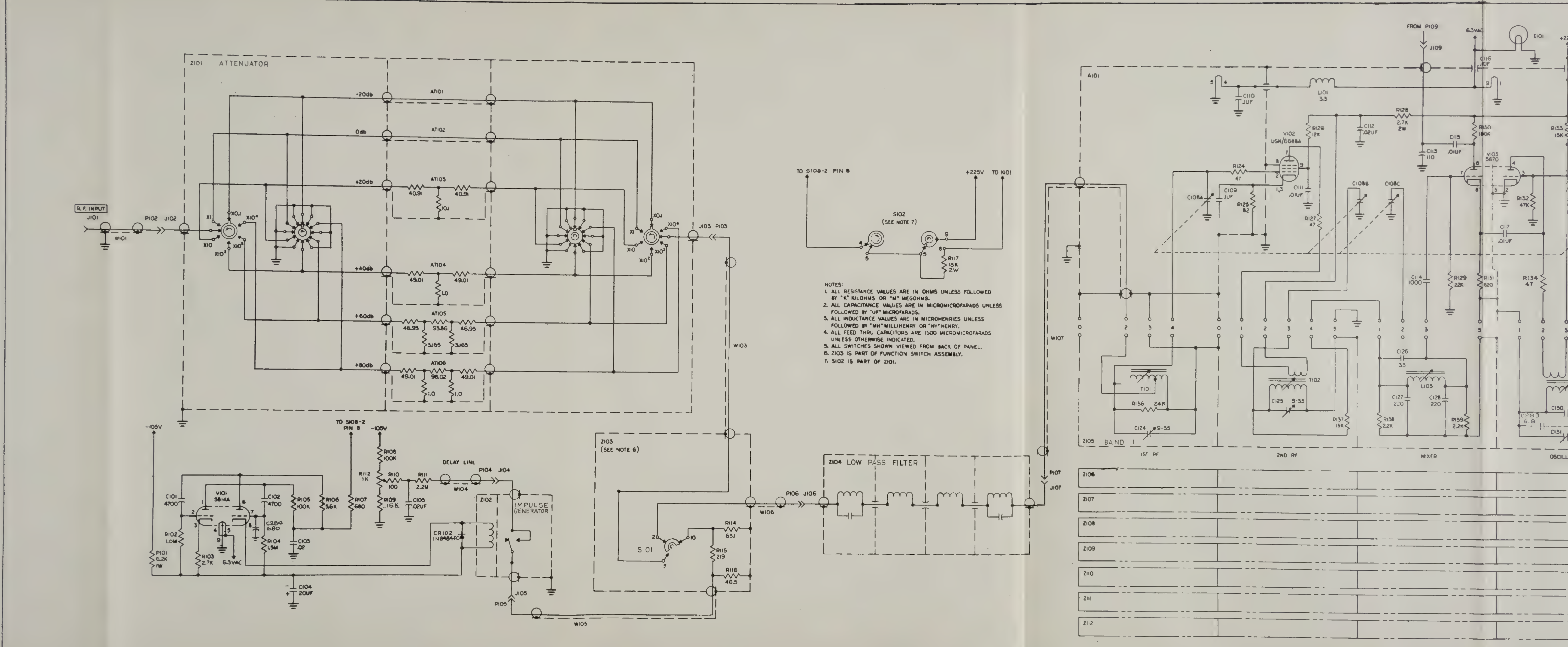


FIGURE 3-4, NM-22A ACCESSORIES



NOTES:

1. ALL RESISTANCE VALUES ARE IN OHMS UNLESS FOLLOWED BY "K" KILOHMS OR "M" MEGOHMS.
2. ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS UNLESS FOLLOWED BY "UF" MICROFARADS.
3. ALL INDUCTANCE VALUES ARE IN MICROHENRIES UNLESS FOLLOWED BY "MH" MILLIHENRY OR "HY" HENRY.
4. ALL FEED THRU CAPACITORS ARE 1500 MICROMICROFARADS UNLESS OTHERWISE INDICATED.
5. ALL SWITCHES SHOWN VIEWED FROM BACK OF PANEL.
6. Z103 IS PART OF FUNCTION SWITCH ASSEMBLY.
7. S102 IS PART OF Z101.

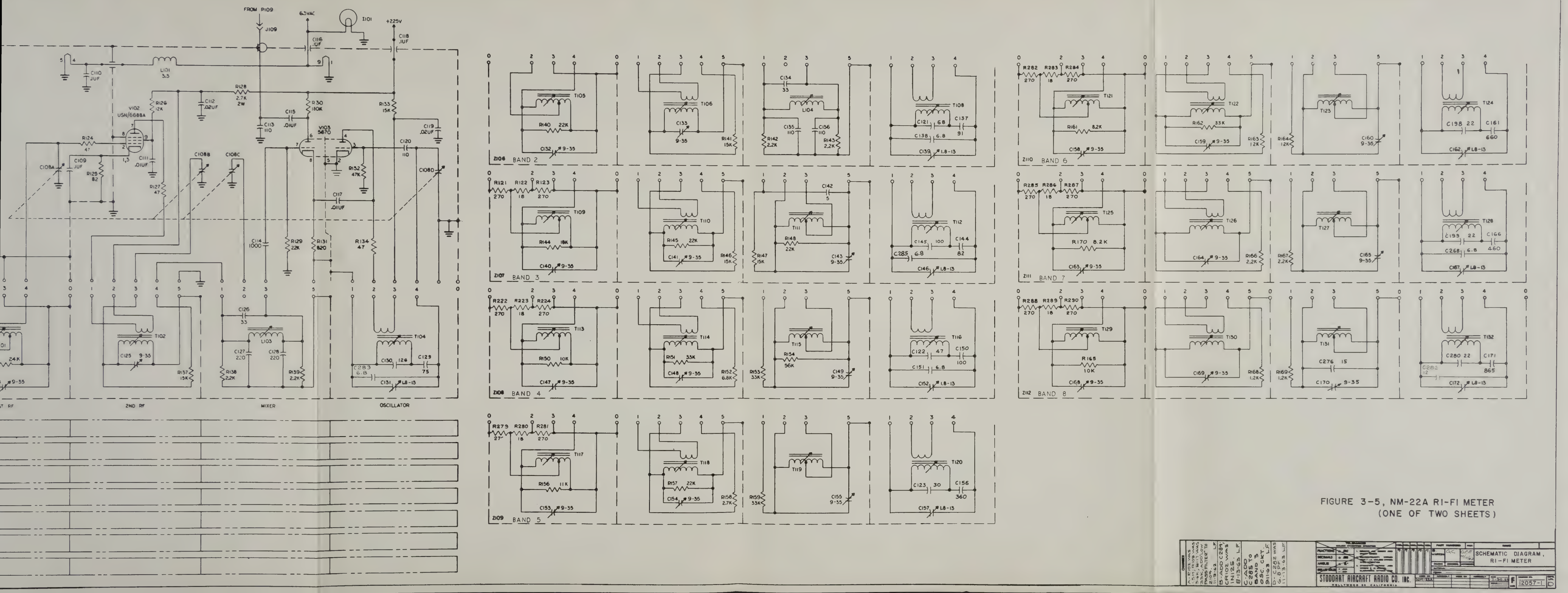
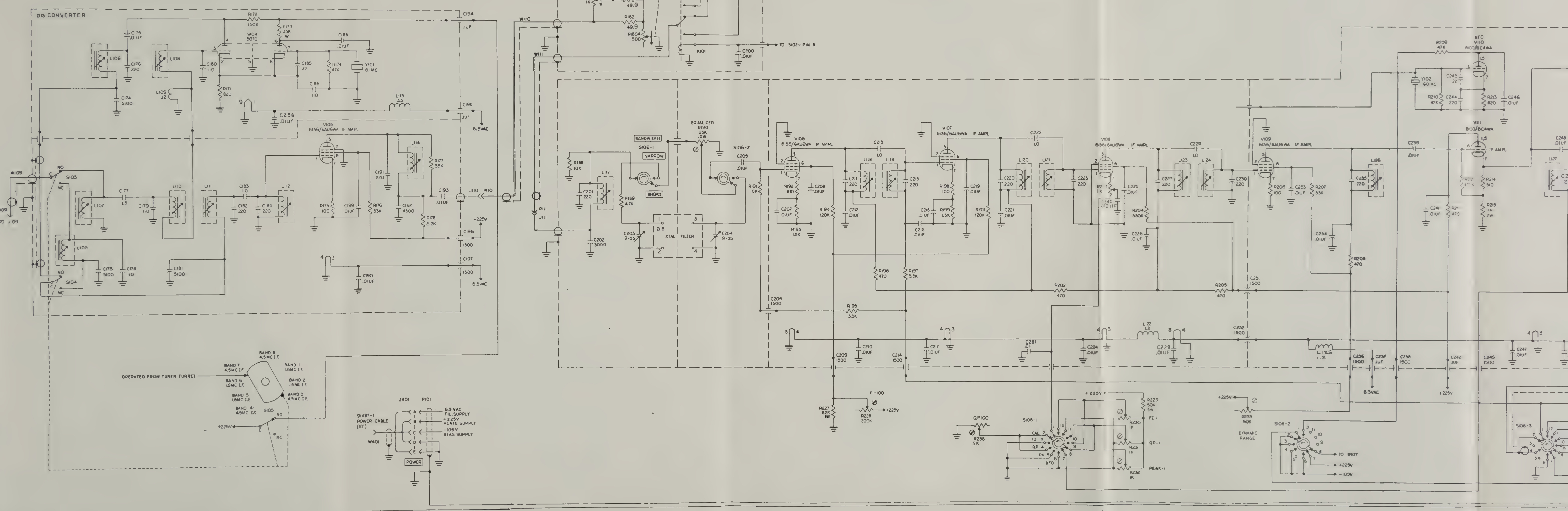


FIGURE 3-5, NM-22A RI-FI METER
(ONE OF TWO SHEETS)

NOTES
1. ALL RESISTANCE VALUES ARE IN OHMS UNLESS FOLLOWED BY "K" KILOHMS OR "M" MEGOHMS.
2. ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS UNLESS FOLLOWED BY "UF" MICROFARADS.
3. ALL INDUCTANCE VALUES ARE IN MICROHENRIES UNLESS FOLLOWED BY "MH" MILLIHENRY OR "HY" HENRY.
4. ALL FEED THRU CAPACITORS ARE 1500 MICROMICROFARADS UNLESS OTHERWISE INDICATED.
5. PEAK = PANEL ADJUST
6. ⊘ = SCREW DRIVER ADJUST
7. R268 IS MECHANICALLY COUPLED TO TUNING DIAL.



CHANGES
A-MOVED C187 FROM V105 HTR. BY-PASS V112 HTR.; CHANGE K101 WIRING; CHANGE R204 & R207 CONNECTIONS; CHANGE V109 HTR CONNECTIONS; CHANGE V108 & V109 (6) WIRING. 11-8-62 L.F.
B-MOVED L125 & C264; ADDED R291 (J115); CHANGED J115. 5-15-63 L.F.
C-ADD R292 TO L127 11-13-63 LF
D-DELETE C262; COUPLE J114 TO JUNCT. OF C257 & C261. 2-26-64 L.F.
F-CHANGE R205 FROM 1.2K FIXED TO 1K VAR; R238 WAS 1K; C240 WAS .01UF. 4-15-64 LF

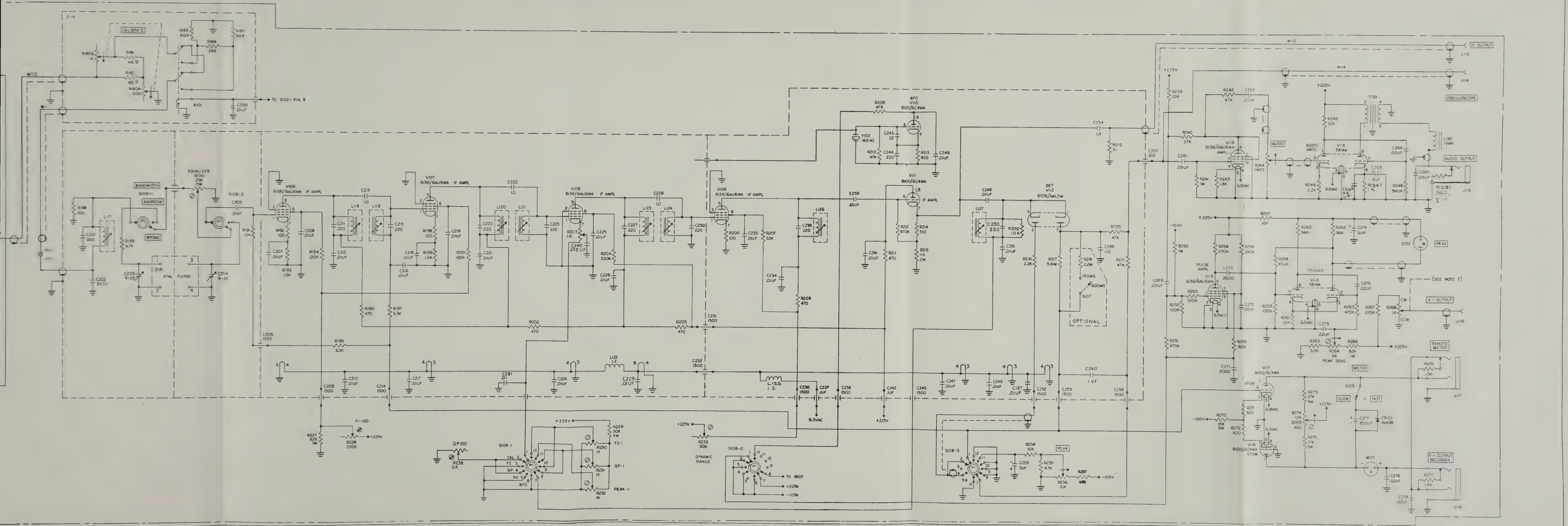


FIGURE 3-5, NM-22A RI-FI METER
(TWO OF TWO SHEETS)

SCHEMATIC DIAGRAM, RI-FI METER

STODDART AIRCRAFT RADIO CO. INC

12057-2 E

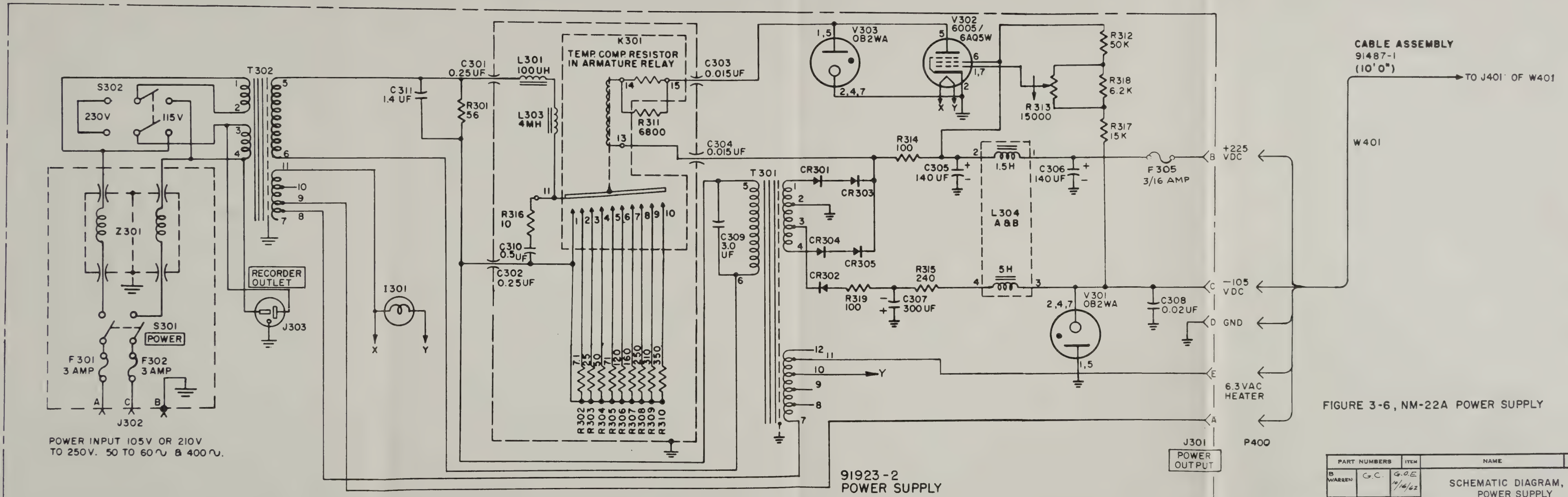


FIGURE 3-6, NM-22A POWER SUPPLY

CHANGE		
A-91923-2 WAS 92196-2 2-10-62 P.G.	B-ADDED F305 12196 PART # 8-20-64 R.J.	

PART NUMBERS	ITEM	NAME
B. WARREN / DRAWN	G.C. / CHECKED	G.O.E. 10/16/62 / APPROVED
MATERIAL		SCHEMATIC DIAGRAM, POWER SUPPLY
FINISH		

STODDART AIRCRAFT RADIO CO. INC.
HOLLYWOOD 38, CALIFORNIA

USED ON	ASSEMBLY	USED ON	ASSEMBLY	DATE	SIZE	DRAWING NO.	CHG. LTR.
NM-22A				7-3-62	M	12058-1	B

PARTS LIST

REFERENCE SYMBOL	NAME and DESCRIPTION	LOCATING FUNCTION
A101	RADIO FREQUENCY TUNER: sub ass'y 150 kc to 32 mc consists of: Z105 thru Z113; output frequency is 1,600 kc; CADV No. 92136-1	p/o RI-FI Meter
AT101	ATTENUATOR, FIXED: p/o Z101 (listed for reference only)	X.1 attenuator position
AT102	Same as AT101	X1 attenuator position
AT103	ATTENUATOR, FIXED: p/o Z101 (listed for reference only)	X10 attenuator position
AT104	ATTENUATOR, FIXED: p/o Z101 (listed for reference only)	$X10^2$ attenuator position
AT105	ATTENUATOR, FIXED: p/o Z101 (listed for reference only)	$X10^3$ attenuator position
AT106	ATTENUATOR, FIXED: p/o Z101 (listed for reference only)	$X10^4$ attenuator position
C101	CAPACITOR, FIXED, MICA DIELECTRIC: 4,700 mmf; ±2%; 300 vdcw; CMF No. DM-19-472G; CADV No. 11643-472	V101 plate coupling
C102	Same as C101	V101 plate coupling
C103	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 20,000 mmf; GMV; 450 vdcw; CER type 817; CADV No. 10493	B + decoupling
C104	CAPACITOR, FIXED, ELECTROLYTIC: 20 mfd; 150 vdcw; CMA No. BS45; CADV No. 11331	V101, C- decoupling
C105	Same as C103	C- bypass
C106	Not used	
C107	Not used	
C108a	CAPACITOR, VARIABLE, AIR DIELECTRIC: four sections; 210 uuf effective capacitance; CRK No. 882502 (Modified) CADV No. 11652	1st RF tuning
C108b	Same as C108a	2nd RF tuning
C108c	Same as C108a	RF mixer tuning
C108d	Same as C108a	Oscillator tuning
C109	CAPACITOR, FIXED, CERAMIC DIELECTRIC: .1 mfd; 10 vdcw; CBN No. UK-10-104; CADV No. 11651	V102, Cathode
C110	Same as C109	V102, heater
C111	CAPACITOR, FIXED CERAMIC DIELECTRIC: .01 mfd; 500 vdcw; CSF No. 19C241; CADV No. 11919	V102, screen
C112	Same as C103	B + decoupling
C113	CAPACITOR, FIXED, MICA DIELECTRIC: 110 mmf; ±2%; 500 vdcw; CMF No. DM10-111-G; CADV No. 11653-111	V103, output
C114	CAPACITOR, FIXED CERAMIC DIELECTRIC: 1,000 mmf; -20 + 100% tol. 500 vdcw; CER CK61Y102Z; CADV No. 11020	V103, grid coupling
C115	Same as C111	V103, plate coupling
C116	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.1 mfd; 100 vdcw; feed thru type; CSF No. 102P21; CADV No. 11650-1	Heater feed thru
C117	Same as C111	V103, cathode injection
C118	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.1 mfd; 400 vdcw; feed thru type; CSF No. 103P24; CADV No. 11650-4	B + bypass
C119	Same as C103	B + decoupling
C120	Same as C113	V103, grid
C121	CAPACITOR, FIXED, MICA DIELECTRIC: 68 mmf; ±1%, 500 vdcw; Arco Elec. type DM-10; CADV No. 11852-680	T108, shunt
C122	CAPACITOR, FIXED, MICA DIELECTRIC: 47 mmf; ±2%; 500 vdcw; Arco Elec. type DM-10; CADV No. 11653-470	T116, shunt

REFERENCE SYMBOL	NAME and DESCRIPTION	LOCATING FUNCTION
C123	CAPACITOR, FIXED, MICA DIELECTRIC: 30 mmf; ±2%; 500 vdcw; Arco Elec. type DM-10; CADV No. 11653-300	T120, shunt
C124	CAPACITOR, VARIABLE, CERAMIC DIELECTRIC: 9-35 mmf; N650 type; CER No. SK1879-001-S-N650- 9 to 35 pf; CADV No. 12018-2	Trimmer p/o Z105
C125	Same as C124	Trimmer p/o Z105
C126	CAPACITOR, FIXED, MICA DIELECTRIC: 33 mmf; ±2%; 500 vdcw; CMF No. DM10-330-G; CADV No. 11653-330	p/o Z105 coupling
C127	CAPACITOR, FIXED, MICA DIELECTRIC: 220 mmf; ±2%; 500 vdcw; CMF No. DM10-221-G; CADV No. 11653-221	p/o Z105 shunt L103
C128	Same as C127	Z105, shunt
C129	CAPACITOR, FIXED, MICA: 75 mmf; ±1%; 500 vdcw; CMF No. DM10-101F; CADV No. 11852-750	p/o Z105 padder
C130	CAPACITOR, FIXED, MICA DIELECTRIC: 126 mmf; ±1%; 500 vdcw; Arco Elec. type DM-10; CADV No. 11852-126R	p/o Z105 T104, shunt
C131	CAPACITOR, VARIABLE, AIR DIELECTRIC: 1.8-13 mmf, CEJ No. 189-6-7; CADV No. 11999	Trimmer p/o Z105
C132	Same as C124	Trimmer p/o Z106
C133	Same as C124	Trimmer p/o Z106
C134	Same as C126	p/o Z106 coupling
C135	CAPACITOR, FIXED, MICA DIELECTRIC: 110 mmf; ±2%; 500 vdcw; CMF No. DM10-111-G; CADV No. 11653-11	p/o Z106 shunt
C136	Same as C135	p/o Z106 shunt
C137	CAPACITOR, FIXED, MICA DIELECTRIC: 91 mmf; ±1%; 500 vdcw; CMF Number DM10-910-F; CADV NO. 11852-910	p/o Z106 padder
C138	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 6.8 mmf; NPO; 600 vdcw; CBN No. TCZ-6R8; CADV No. 11658-6R8	p/o Z106 shunt
C139	Same as C131	Trimmer p/o Z106
C140	Same as C124	Trimmer p/o Z107
C141	Same as C124	Trimmer p/o Z107
C142	CAPACITOR, FIXED, MICA DIELECTRIC: 5 mmf; ±10%; 500 vdcw; CMF Number DM10-050-K; CADV No. 12083-050	Padder p/o Z107
C143	Same as C124	Trimmer p/o Z107
C144	CAPACITOR, FIXED, MICA DIELECTRIC: 82 mmf; ±1%; 500 vdcw; CMF Number DM10-820F; CADV No. 11852-820	p/o Z107 padder
C145	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 100 mmf; ±2%; N1500; 200 vdcw CER No. 4835; CADV No. 12043-101	T112, shunt
C146	Same as C131	Trimmer p/o Z107
C147	Same as C124	Trimmer p/o Z108
C148	Same as C124	Trimmer p/o Z108
C149	Same as C124	Trimmer capacitor p/o Z108
C150	CAPACITOR, FIXED, MICA DIELECTRIC: 100 mmf; ±1%; 500 vdcw; CMF Number DM10-700F; CADV No. 11852-101	Padder p/o Z108
C151	Same as C138	Osc. shunt p/o Z108
C152	Same as C131	Trimmer p/o Z108
C153	Same as C124	Shunt p/o Z108

PARTS LIST

REFERENCE SYMBOL	NAME and DESCRIPTION	LOCATING FUNCTION
C154	Same as C124	Padder p/o Z109
C155	Same as C124	Trimmer p/o Z109
C156	CAPACITOR, FIXED, MICA DIELECTRIC: 360 mmf; ±1%; 500 vdcw; CMF Number DM10-361F; CADV No. 11852-361	Padder p/o Z109
C157	Same as C131	Trimmer p/o Z109
C158	Same as C124	Trimmer p/o Z110
C159	Same as C124	Shunt p/o Z110
C160	Same as C124	Padder p/o Z110
C161	CAPACITOR, FIXED, MICA DIELECTRIC: 660 mmf; ±1%; 500 vdcw; CMF Number DM15-661F; CADV No. 11654-661	Padder p/o Z110
C162	Same as C131	Trimmer p/o Z110
C163	Same as C124	Trimmer p/o Z111
C164	Same as C124	Trimmer p/o Z111
C165	Same as C124	Trimmer p/o Z111
C166	CAPACITOR, FIXED, MICA DIELECTRIC: 460 mfd; ±1%; 300 vdcw; CMF Number DM15-460F; CADV No. 11654-461	Padder p/o Z111
C167	Same as C131	Trimmer p/o Z111
C168	Same as C124	Trimmer p/o Z112
C169	Same as C124	Trimmer p/o Z112
C170	Same as C124	Trimmer p/o Z112
C171	CAPACITOR, FIXED, MICA DIELECTRIC: 865 mfd; ±1%; 300 vdcw; CMF Number DM15-865F; CADV 11654-865R	Padder p/o Z112
C172	Same as C131	Padder p/o Z112
C173	CAPACITOR, FIXED, MICA DIELECTRIC: 5100 mmf; ±2%; 300 vdcw; CMF Number DM19-512-G; CADV No. 11643-512	Coupling p/o Z113
C174	Same as C173	Coupling p/o Z113
C175	Same as C111	Coupling p/o Z113
C176	Same as C127	Coupling p/o Z113
C177	CAPACITOR, FIXED, CERAMIC DIELEC-TRIC: 1.5 mmf; NPO; 600 vdcw; CBN No. TCZ-1R5; CADV No. 11658-1R5	Coupling p/o Z113
C178	Same as C113	Coupling p/o Z113
C179	Same as C113	Coupling p/o Z113
C180	Same as C113	Coupling p/o Z113
C181	Same as C173	Coupling p/o Z113
C182	Same as C127	Coupling p/o Z113
C183	CAPACITOR, FIXED, CERAMIC DIELEC-TRIC: 1 mmfd; NPO; 600 vdcw; CBN No. TCZ-1R; CADV No. 11658-1R	Coupling p/o Z113
C184	Same as C127	Coupling p/o Z113
C185	CAPACITOR, FIXED, MICA DIELECTRIC: 22 mmf; ±5%; 500 vdcw; CCBK Number DM15-220-J; CADV No. 11750-220	Coupling p/o Z113
C186	Same as C113	Coupling p/o Z113
C187	Same as C111	V105, cathode bypass

REFERENCE SYMBOL	NAME and DESCRIPTION	LOCATING FUNCTION
C188	Same as C111	V104, plate bypass
C189	Same as C111	V105, screen bypass
C190	Same as C111	Heater bypass
C191	Same as C127	V105, plate tuning
C192	CAPACITOR, FIXED, MICA DIELECTRIC: 4300 mmf; ±2%; 300 vdcw; CMF Number DM19-432-G; CADV 11643-432	De-coupling p/o Z113
C193	Same as C103	Coupling p/o Z113
C194	Same as C118	B + bypass
C195	Same as C116	Heater bypass
C196	CAPACITOR, FIXED, CERAMIC DIELEC-TRIC: 1500 mmf; +20%; 500 vdcw; CER No. 362; CADV No. 10364	B + bypass
C197	Same as C196	Coupling p/o Z113
C198	CAPACITOR, FIXED, MICA DIELECTRIC: 22 mmf; ±5%; 500 vdcw; Arco Elec. type DM-10; CADV No. 11750-220	T124, shunt
C199	Same as C198	T128, shunt
C200	Same as C111	K101, bypass
C201	Same as C127	L117, tuning
C202	CAPACITOR, FIXED, MICA DIELECTRIC: 3,000 mmf; ±2%; 300 vdcw; CMF No. DM19-302-G; CADV No. 11643-302	L117, bypass
C203	Same as C124	Trimmer Z115, input
C204	Same as C124	Trimmer Z115, output
C205	Same as C111	V106, grid coupling
C206	Same as C196	AVC, feed thru
C207	Same as C111	V106, cathode bypass
C208	Same as C111	V106, screen bypass
C209	Same as C196	Feed thru
C210	Same as C111	Heater bypass
C211	Same as C127	L118, tuned circuit
C212	Same as C111	L118, decoup-ling
C213	Same as C183	V106-V107 coupling
C214	Same as C196	AVC feed thru
C215	Same as C127	L119, tuning
C216	Same as C111	V107, grid decoupling
C217	Same as C111	Heater bypass
C218	Same as C111	V107, cathode bypass
C219	Same as C111	V107, screen bypass
C220	Same as C127	L120, tuning
C221	Same as C111	V107, plate decoupling
C222	Same as C183	V107, plate to V108, grid coupling
C223	Same as C127	L121, tuning
C224	Same as C111	Heater bypass
C225	Same as C111	V108, screen bypass
C226	Same as C111	B + decoup-ling

PARTS LIST

REFERENCE SYMBOL	NAME and DESCRIPTION	LOCATING FUNCTION
C227	Same as C127	L123, tuning
C228	Same as C111	Heater bypass
C229	Same as C183	V108, plate to V109 grid coupling
C230	Same as C127	L124, tuning
C231	Same as C196	B + feed thru
C232	Same as C196	Heater feed thru
C233	Same as C111	V109. screen bypass
C234	Same as C111	V109, plate decoupling
C235	Same as C127	L126, tuning
C236	Same as C196	B + feed thru
C237	Same as C116	Heater feed thru
C238	Same as C196	B + feed thru
C239	Same as C111	V109 plate to V111 grid
C240	CAPACITOR, FIXED, CERAMIC DIELECTRIC: .012 mfd; +10%; 200 vdcw; Mucon Corp.2E012RR;CADV no. 18199	V108, cathode bypass
C241	Same as C111	V111, plate bypass
C242	Same as C118	B + feed thru
C243	CAPACITOR, FIXED, MICA DIELECTRIC: 22 mmf; +5%; 500 vdcw; CMF Number DM15-220J; CADV No. 11308-220	p/o V110, grid circuit
C244	Same as C127	p/o V110, grid circuit
C245	Same as C196	V112, bias feed thru
C246	Same as C111	V110, plate decoupling
C247	Same as C111	Heater bypass
C248	Same as C111	V111 to V112 coupling
C249	Same as C111	Heater bypass
C250	Same as C127	L127, tuning
C251	Same as C111	V112, bias decoupling
C252	Same as C196	V112, feed thru
C253	Same as C196	V112, feed thru
C254	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 1.5 mmf; NPO; 600 vdcw; CBN No. TCZ-1R5; CADV No. 11658-1R5	IF output coupling
C255	Same as C113	V112, output filter
C256	Same as C196	V112, feed thru
C257	CAPACITOR, FIXED, CERAMIC, DIELECTRIC: 100 mmf; 500 vdcw; feed thru type; CSF No. BH310; CADV No. 11657	V112, output feed thru
C258	Same as C111	V104, heater
C259	CAPACITOR, FIXED, ELECTROLYTIC: 5 mfd; -15 +50%; 50 vdcw; CATD No. PP5B50A2; CADV No. 10677	Decoupling
C260	CAPACITOR, FIXED, PAPER DIELECTRIC 100,000 mmf; +5%; 50 vdcw; Westcap No. MS4J104; CADV No. 11935	V112, output filter
C261	CAPACITOR, FIXED, PAPER, DIELECTRIC 50,000 mmf; -10% +20%; 200 vdcw; CAMD No. MD; CADV No. 10196	V113, grid coupling
C262	Same as C103	Oscilloscope output coupling
C263	Same as C103	Audio coupling
C264	Same as C103	V114, cathode bypass
C265	Same as C259	V114, cathode bypass
C266	Same as C103	V114, coupling
C267	Same as C261	Audio output bypass
C268	Same as C138	Osc. shunt p/o Z111
C269	Same as C103	V115, input coupling
C270	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 2,000 mmf; -0% +100%; 500 vdcw; CER No. 801-.002; CADV No. 10668	V115, output coupling
C271	Same as C270	Decoupling
C272	Same as C103	V115, screen bypass
C273	Same as C103	V116, grid decoupling
C274	CAPACITOR, FIXED, ELECTROLYTIC: 6 mfd; 400 vdcw; CER No. CE64C-060Q; CADV No. 11026	B + bypass
C275	Same as C103	
C276	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 15 mmf; 600 vdcw;NPO; CBN No. TCZ-15; CADV No. 11658-15R	T131, shunt
C277	CAPACITORS, FIXED, ELECTROLYTIC: 250 mfd; 50 vdcw; at 85 C; CSF No. TVA1312; CADV No. 11975-251	Meter response
C278	Same as C103	Meter circuit bypass
C279	Same as C103	Meter circuit bypass
C280	Same as C198	T132, shunt
C281	Same as C111	V108, cathode circuit bypass
C282	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 12 mmf; NPO,600 vdcw; Centralab type TCZ; CADV No. 11658-12R	T132, shunt
C283	Same as C138	T104, shunt
C284	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 680 mmf; +5%; 300 vdcw; Arco Elec. type DM15-681J; CADV No. 11472-681	bypass, capacitor
C285	Same as C138	p/o Z107, shunt
CR101	SEMICONDUCTOR DEVICE DIODE: germanium, type 1N498; CADV No. 1N498	Protects, C277
CR102	SEMICONDUCTOR DEVICE DIODE: type 2484FC; CADV No. 2484FC	Z102,shunt
E101	SHIELD, ELECTRON TUBE: heat dissipating type; MS24233-5; CADV No. 11339	V101, tube shield
E102	SHIELD, ELECTRON TUBE: heat dissipating type; MS24233-4; CADV No. 11340	V102, tube shield
E103	Same as E102	V103, tube shield
E104	Same as E102	V104, tube shield
E105	SHIELD, ELECTRON TUBE: heat dissipating type; MS24233-2; CADV No. 11341	V105, tube shield
E106	Same as E105	V106, tube shield
E107	Same as E105	V107, tube shield
E108	Same as E105	V108, tube shield
E109	Same as E105	V109, tube shield
E110	Same as E105	V110, tube shield
E111	Same as E105	V111, tube shield
E112	SHIELD, ELECTRON TUBE: heat dissipating type; MS24233-1; CADV No. 11343	V112, tube shield
E113	Same as E105	V113, tube shield
E114	Same as E101	V114, tube shield

PARTS LIST

REFERENCE SYMBOL	NAME and DESCRIPTION	LOCATING FUNCTION
E115	Same as E105	V115, tube shield
E116	Same as E101	V116, tube shield
E117	Same as E105	V117, tube shield
E118	Same as E105	V118, tube shield
E119	POST, BINDING; SCREW type; CEB No. 6603; CADV No. 10171	Panel ground connection
I101	LAMP, INCANDESCENT: 6 to 8 volts; 0.15 amps; CG No. GE-47; CADV No. 10051	Dial light
I102	LAMP, GLOW: Neon Gas; double contact Bayonet Base; CG No. NE-48; CADV No. 10726	Visual null indicator
J101	CONNECTOR, RECEPTACLE, ELECTRICAL: Panel mounted BNC type; UG-291B/U; CADV No. 10121	"RF Input" p/o W101
J102	CONNECTOR, RECEPTACLE, ELECTRICAL: Microminiature screw type; CCMY No. 31-03; CADV No. 11726	RF attenuator Input p/o Z101
J103	Same as J102	RF attenuator Output p/o Z101
J104	CONNECTOR, RECEPTACLE, ELECTRICAL: Microminiature screw type; CCMY No. 31-50; CADV No. 11564	Input of Z102
J105	Same as J104	Output of Z102
J106	CONNECTOR, RECEPTACLE, ELECTRICAL: Microminiature screw type; CCMY No. 33-01; CADV No. 11748	Input of Z104
J107	Same as J106	Output of Z104
J108	Not used	
J109	Same as J104	A101, output
J110	Same as J104	Z113, output
J111	Same as J104	Z114, input
J112	Not used	
J113	Same as J101	"IF output"
J114	Same as J101	"Oscilloscope output"
J115	JACK TELEPHONE: MIL type JJ-089 Switchcraft no. C-12A,CADV no. 18003	"Audio Output"
J116	CONNECTOR, RECEPTACLE, ELECTRICAL: Slide-on-type; Electro Physics Lab. No. R95-2200; CADV No. 11682	"X-output"
J117	JACK, TELEPHONE: for 3 conductor plug; CBIM No. 2J1047A; CADV No. 10123	"Remote meter"
J118	Same as J117	"Y-output recorder"
K101	RELAY ARMATURE: 110 vdc; 4 contacts, 2 closed contacts; Elgin Elect. No. MVT2C 10,000D13; CADV No. 11621	p/o Z114
L101	COIL, RADIO FREQUENCY: 3.3 uh molded choke; Delevan Mfg. No. 2890-3R3;CADV No. 11631-3R3	Heater RF choke
L102	Not used	
L103	COIL, RADIO FREQUENCY: variable inductance (listed for reference only) CADV No. 92711-1	p/o Z105
L104	Same as L103	p/o Z106
L105	COIL, RADIO FREQUENCY: variable inductance (listed for reference only) CADV No. 92179-1	p/o Z113
L106	Same as L105	p/o Z113
L107	COIL, RADIO FREQUENCY: variable inductance (listed for reference only) CADV No. 92169-1	p/o Z113
L108	Same as L107	p/o Z113
L109	COIL RADIO FREQUENCY: .12 uh molded choke; CADV No. 92170-1	p/o Z113

REFERENCE SYMBOL	NAME and DESCRIPTION	LOCATING FUNCTION
L110	Same as L107	p/o Z113
L111	Same as L105	p/o Z113
L112	Same as L105	p/o Z113
L113	Same as L101	V104, heater
L114	Same as L105	p/o Z113
L115	Not used	
L116	Not used	
L117	Same as L105	Z115, input
L118	Same as L105	V106, output
L119	Same as L105	V107, input
L120	Same as L105	V107, output
L121	Same as L105	V108, input
L122	COIL RADIO FREQUENCY: 1.2 uh molded choke; Delevan Mfg. No. 2890-1R2 CADV No. 11631-1R2	V108, heater
L123	Same as L105	V108, output
L124	Same as L105	V109, input
L125	Same as L122	V109, heater
L126	Same as L105	V109, output
L127	Same as L105	V112, input
L128	Not used	
L129	Not used	
L130	COIL RADIO FREQUENCY: 19 mh; rf choke; iron core; CADV No. 90825-1	Audio output
M101	METER MULTI-SCALE: dc; 0-1 ma; ±1% accuracy; CADV No. 10702	Panel meter
MP101	KNOB: skirted pointer; black matte finish; CADV No. 21331	"Attenuator"
MP102	Same as MP101	"Function"
MP103	KNOB: skirted round; red matte finish; CADV No. 21292	"CAL"
MP104	KNOB: skirted round; black matte finish; white dot marker; CADV No. 21293	"Bandwidth"
MP105	KNOB: skirted round; black matte finish; CADV No. 21346-1	"Peak"
MP106	KNOB: bar type; black phenolic; CADV No. 20375	"Band"
MP107	KNOB: crank; black matte finish; CADV No. 21294	"Tuning"
MP108	KNOB: skirted round; black matte finish; CADV No. 21290	"Audio"
MP109	COVER, TELEPHONE, JACK: steel; black matte finish; CBIM no. 515; CADV No. 11732	"Remote meter"
MP110	Same as MP109	"Y-output recorder"
MP111	Same as MP109	"Audio output"
P101	CONNECTOR, PLUG, ELECTRICAL: 5 round male contacts; panel mounted; MS3102E14S5P; CADV No. 11178	"Power"
P102	CONNECTOR, PLUG, ELECTRICAL: (FOR REF ONLY)	p/o W101
P103	Same as P102	p/o W103
P104	CONNECTOR, PLUG, ELECTRICAL: 50 ohm coaxial (FOR REFERENCE ONLY)	p/o W104
P105	Same as P104	p/o W105
P106	Same as P102	p/o W106
P107	Same as P102	p/o W107
P108	Not used	
P109	Same as P102	p/o W109
P110	Same as P102	p/o W110
P111	Same as P102	p/o W111

PARTS LIST

REFERENCE SYMBOL	NAME and DESCRIPTION	LOCATING FUNCTION
R112	Not used	
R101	RESISTOR, FIXED, COMPOSITION: 6,200 ohms; ±5%; 1 w; CBZ No. GB6225; CADV No. 10012-622	V101, grid bias
R102	RESISTOR, FIXED, COMPOSITION: 1.5 meg ohm; ±5%; 1/2 w; CBZ No. EB-1555; CADV No. 10011-155	V101, grid
R103	RESISTOR, FIXED, COMPOSITION: 2700 ohms; ±5%; 1/2 w; CBZ No. EB-2725; CADV No. 10011-272	V101, cathode bias
R104	Same as R102	V101, grid
R105	RESISTOR, FIXED, COMPOSITION: 100,000 ohms; ±5%; 1/2 w; CBZ No. EB-1045; CADV No. 10011-104	V101, plate
R106	RESISTOR, FIXED, COMPOSITION: 5600 ohms; ±5%; 1/2 w; CBZ No. EB-5625; CADV No. 10011-562	V101, plate
R107	RESISTOR, FIXED, COMPOSITION: 680 ohms; ±5%; 1/2 w; CBZ No. EB-6815; CADV No. 10011-681	V101, decoupling
R108	RESISTOR, FIXED, COMPOSITION: 100,000 ohms; ±5%; 1/2 w; CBZ No. EB-1045; CADV No. 10011-104	p/o Z102, voltage divider
R109	RESISTOR, FIXED, COMPOSITION: 3,600 ohms; ±5%; 1/2 w; CBZ No. EB-3625; CADV No. 10011-362	p/o Z102, voltage divider
R110	RESISTOR, FIXED, COMPOSITION: 100 ohms; ±5%; 1/2 w; CBZ No. EB-1015; CADV No. 10011-101	p/o Z102, voltage divider
R111	RESISTOR, FIXED, COMPOSITION: 2.2 megohms; ±5% tol; 1/2 w; CBZ No. EB-2255; CADV No. 10011-225	p/o Z102, voltage divider
R112	RESISTOR, VARIABLE, COMPOSITION: 1,000 ohms; ±10%; 2 w; CBZ No. type J; CADV No. 10141	Z102, output adj
R113	Not used	
R114	RESISTOR, FIXED, FILM: 63.1 ohms; ±1%; 1/8 w; Penn Resistor Corp. No. FCAD5; CADV No. 11749-63R1	p/o Z103
R115	RESISTOR, FIXED, FILM: 219 ohms; ±1%; 1/8 w; Penn Resistor Corp. No. FCAD5; CADV No. 11749-219R	p/o Z103
R116	RESISTOR, FIXED, FILM: 46.5 ohms; ±1%; 1/8 w; Penn Resistor Corp. No. FCAD5; CADV No. 11749-46R5	p/o Z103
R117	RESISTOR, FIXED, COMPOSITION: 33,000 ohms; ±5%; 1 w; CBZ No. GB-3335; CADV No. 10012-333	p/o S102
R118	Not used	
R119	Not used	
R120	Not used	
R121	RESISTOR, FIXED, COMPOSITION: 270 ohms; ±5%; 1/4 w; CBZ No. CB-2715; CADV No. 11693-271	p/o Z107
R122	RESISTOR, FIXED, COMPOSITION: 18 ohms; ±5%; 1/4 w; CBZ No. CB-1805; CADV No. 11693-180	p/o Z107
R123	Same as R121	p/o Z107
R124	RESISTOR, FIXED, COMPOSITION: 47 ohms; ±5%; 1/4 w; CBZ No. CB-4705; CADV No. 11693-470	V102 grid
R125	RESISTOR, FIXED, COMPOSITION: 82 ohms; ±5%; 1/4 w; CBZ No. CB-8205; CADV No. 11693-820	V102, cathode
R126	RESISTOR, FIXED, COMPOSITION: 12,000 ohms; ±5%; 1/2 w; CBZ No. EB-1235; CADV No. 10011-123	V102, screen
R127	Same as R124	V102, plate
R128	RESISTOR, FIXED, COMPOSITION: 2700 ohms; ±5%; 2 w; CBZ No. HB-2725; CADV No. 10377-272	V102, plate decoupling
R129	RESISTOR, FIXED, COMPOSITION: 22,000 ohms; ±5%; 1/4 w; CBZ No. CB-2235; CADV No. 11693-223	V103, grid
R130	RESISTOR, FIXED, COMPOSITION: 180,000 ohms; ±5%; 1/2 w; CBZ No. EB-1845; CADV No. 10011-184	V103, plate

REFERENCE SYMBOL	NAME and DESCRIPTION	LOCATING FUNCTION
R131	RESISTOR, FIXED, COMPOSITION: 820 ohms; ±5%; 1/4 w; CBZ No. CB-8215; CADV No. 11693-821	V103, cathode
R132	RESISTOR, FIXED, COMPOSITION: 47,000 ohms; ±5%; 1/4 w; CBZ No. CB-4735; CADV No. 11693-473	V103, grid
R133	RESISTOR, FIXED, COMPOSITION: 15,000 ohms; ±5%; 1/2 w; CBZ type EB-1535; CADV No. 10011-153	V103, plate decoupling
R134	Same as R124	V103, plate
R135	Not used	
R136	RESISTOR, FIXED, COMPOSITION: 24,000 ohms; ±5%; 1/4 w; CBZ type CB-2435; CADV No. 11693-243	T101, shunt
R137	RESISTOR, FIXED, COMPOSITION: 15,000 ohms; ±5%; 1/4 w; CBZ type CB-1535; CADV No. 11693-153	T102, shunt
R138	RESISTOR, FIXED, COMPOSITION: 2,200 ohms; ±5%; 1/4 w; CBZ type CB-2225; CADV No. 11693-222	L103, loading
R139	Same as R138	L103, loading
R140	Same as R129	T105, shunt
R141	Same as R137	T106, output
R142	Same as R138	L104, loading
R143	Same as R138	L104, loading
R144	RESISTOR, FIXED, COMPOSITION: 18,000 ohms; ±5%; 1/4 w; CBZ No. CB-1835; CADV No. 11693-183	T109, shunt
R145	Same as R129	T110, shunt
R146	Same as R137	T110, output
R147	Same as R137	T111, input
R148	Same as R129	T111, shunt
R149	Not used	
R150	RESISTOR, FIXED, COMPOSITION: 10,000 ohms; ±5%; 1/4 w; CBZ No. CB-1035; CADV No. 11693-103	T113, shunt
R151	RESISTOR, FIXED, COMPOSITION: 33,000 ohms; ±5%; 1/4 w; CBZ No. CB-3335; CADV No. 11693-333	T114, shunt
R152	RESISTOR, FIXED, COMPOSITION: 6,800 ohms; ±5%; 1/4 w; CBZ No. CB-6825; CADV No. 11693-682	T114, output
R153	Same as R151	T115, input
R154	RESISTOR, FIXED, COMPOSITION: 56,000 ohms; ±5%; 1/4 w; CBZ No. CB-5635; CADV No. 11693-563	T115, shunt
R155	Not used	
R156	RESISTOR, FIXED, COMPOSITION: 11,000 ohms; ±5%; 1/4 w; CBZ No. CB-1135; 11693-113	T117, shunt
R157	Same as R129	T118, shunt
R158	RESISTOR, FIXED, COMPOSITION: 2,700 ohms; ±5%; 1/4 w; CBZ No. CB-2725; CADV No. 11693-272	T118, output
R159	Same as R151	T119, input
R160	Not used	
R161	RESISTOR, FIXED, COMPOSITION: 8,200 ohms; ±5%; 1/4 w; CBZ No. CB-8225; CADV No. 11693-822	T121, shunt
R162	Same as R151	T122, shunt
R163	RESISTOR, FIXED, COMPOSITION: 12,000 ohms; ±5%; 1/4 w; CBZ No. CB-1235; CADV No. 11693-123	T122, output
R164	Same as R163	T123, input
R165	Same as R163	T129, shunt
R166	Same as R138	T126, output
R167	Same as R138	T127, input
R168	RESISTOR, FIXED, COMPOSITION: 1,200 ohms; ±5%; 1/4 w; CBZ No. CB-1225; CADV No. 11693-122	T130, output
R169	Same as R168	T131, input

PARTS LIST

REFERENCE SYMBOL	NAME and DESCRIPTION	LOCATING FUNCTION
R170	Same as R161	T125, shunt
R171	RESISTOR, FIXED, COMPOSITION: 820 ohms; +5%; 1/2 w; CBZ No. EB-8215; CADV No. 10011-821	V104, cathode
R172	RESISTOR, FIXED, COMPOSITION: 150,000 ohms; +5%; 1/2 w; CBZ No. EB-1545; CADV No. 10011-154	V104, plate
R173	RESISTOR, FIXED, COMPOSITION: 33,000 ohms; +5%; 1 w; CBZ No. GB-3335; CADV No. 10012-333	V104, plate
R174	Same as R132	V104, grid
R175	Same as R110	V105, cathode
R176	RESISTOR, FIXED, COMPOSITION: 33,000 ohms; +5%; 1/2 w; CBZ No. EB-3335; CADV No. 10011-333	V105, screen
R177	RESISTOR, FIXED, COMPOSITION: 39,000 ohms; +5%; 1/4 w; CBZ No. CB-3935; CADV No. 11693-393	L114, shunt
R178	Same as R138	V105, plate decoupling
R179	Not used	
R180a,b	RESISTOR, VARIABLE: composition; 2 sections 1000 ohms rear; 500 ohms front; +10%; 2 w; CBZ type JJ, B-1021, A-5011; CADV No. 11922-28	CAL control
R181	RESISTOR, FIXED, FILM: 49.9ohms; +1%; 1/2 w; CGO No. RN20X49R9; CADV No. 11661-49R9	p/o CAL network
R182	Same as R181	p/o CAL network
R183	RESISTOR, FIXED, FILM: 60.4 ohms; +1%; 1/2 w; CGO No. RN20X60R4; CADV No. 11661-60R4	p/o Z114
R184	RESISTOR, FIXED, FILM: 249 ohms; +1%; 1/2 w; CGO No. RN20X249R; CADV No. 11661-249R	p/o Z114
R185	Same as R183	p/o Z114
R186	Not used	
R187	Not used	
R188	Same as R150	L117, load
R189	RESISTOR, FIXED, COMPOSITION: 4,700 ohms; +5%; 1/4 w; CBZ No. 4725; CADV No. 11693-472	Z115, input
R190	RESISTOR, VARIABLE: composition; 25,000 ohms; 1/2 w; COM No. 3608; CADV No. 11633-253	EQUALIZER
R191	Same as R150	V106, grid
R192	Same as R110	V106, cathode
R193	RESISTOR, FIXED, COMPOSITION: 1,500 ohms; +5%; tol. 1/2 w; CBZ No. EB-1525; CADV No. 10011-152	V106, cathode
R194	RESISTOR, FIXED, COMPOSITION: 120,000 ohms; +5%;1/2 w; CBZ No. EB-1245; CADV No. 10011-124	V106, screen
R195	RESISTOR, FIXED, COMPOSITION: 3,300 ohms; +5%; 1/4 w; CBZ No. CB-3325; CADV No. 11693-332	V106, grid decoupling
R196	RESISTOR, FIXED, COMPOSITION: 470 ohms; +5%; 1/4 w; CBZ No. CB-4715; CADV No. 11693-471	V106, plate decoupling
R197	Same as R195	V107, grid decoupling
R198	Same as R110	V107, cathode
R199	Same as R193	V107, cathode
R200	Not used	
R201	Same as R194	V107, screen
R202	Same as R196	V107, plate decoupling
R203	Same as R168	V108, cathode
R204	RESISTOR, FIXED, COMPOSITION: 330,000 ohms; +5%; 1/2 w; CBZ No. EB-3345; CADV No. 10011-334	V108, screen
R205	Same as R196	V108, plate decoupling
R206	RESISTOR, FIXED, COMPOSITION: 100 ohms; +5%; 1/4 w; CBZ No. CB-1015; CADV No. 11693-101	V109, cathode
R207	RESISTOR, FIXED, COMPOSITION: 33,000 ohms; +5%; 1/2 w; CBZ No. EB-3335; CADV No. 10011-333	V109, screen
R208	Same as R196	V109, plate decoupling
R209	RESISTOR, FIXED, COMPOSITION: 47,000 ohms; +5%; 1/2 w; CBZ No. EB-4735; CADV No. 10011-473	V110, plate
R210	Same as R132	V110, grid
R211	Same as R196	V111, plate
R212	RESISTOR, FIXED, COMPOSITION: 470,000 ohms; +5%; 1/4 w; CBZ No. CB-4745; CADV No. 11693-474	V111, grid
R213	Same as R131	V110, cathode
R214	RESISTOR, FIXED, COMPOSITION: 510 ohms; +5%; 1/4 w; CBZ No. CB-5115; CADV No. 11693-511	V111, cathode
R215	RESISTOR, FIXED, COMPOSITION: 11,000 ohms; +5%; 2 w; CBZ No. HB-1135; CADV No. 10377-113	V111, cathode
R216	Same as R138	V112, plate
R217	RESISTOR, FIXED, COMPOSITION: 5.6 meg ohm; +5%; 1/4 w; CBZ No. CB-5655; CADV No. 11693-565	V112, plate
R218	RESISTOR, FIXED, COMPOSITION: 2.2 megohm; +5%; 1/4 w; CBZ No. CB-2255; CADV No. 11693-225 (optional part p/o S107 if ordered)	R217, shunt
R219	RESISTOR, FIXED, COMPOSITION: 51 ohms; +5%; 1/4 w; CBZ No. CB-5105; CADV No. 11693-510	V111, IF output
R220	Same as R132	V112, output
R221	Same as R132	V112, output
R222	Same as R121	p/o Z108
R223	Same as R122	p/o Z108
R224	Same as R121	p/o Z108
R225	Not used	
R226	Not used	
R227	RESISTOR, FIXED, COMPOSITION: 82,000 ohms; +5%; 1 w; CBZ No. GB-8235; CADV No. 10012-823	"FI-100" load
R228	RESISTOR, VARIABLE: 200,000 ohms; +10%; 2 w; CBZ No. JA1L040S204UC; CADV No. 10139	FI-100 control
R229	RESISTOR, FIXED, WIREWOUND: 50,000 ohms; +5%; 5 w; Dale Prod. No. W5RS-5; CADV No. 11361-503	FI-1, QP-1 peak-1, dropping
R230	Same as R112	"FI-1" control
R231	Same as R230	"QP-1" control
R232	Same as R230	"Peak-1" control
R233	RESISTOR, VARIABLE: composition; 50,000 ohms; +10%; 2 w; CBZ No. type J; CADV No. 10379-503	"Dyn. range" control
R234	RESISTOR, FIXED, COMPOSITION: 10,000 ohms; +5%; 1/2 w; CBZ No. EB-1035; CADV No. 10011-103	"Peak" control decoupling
R235	RESISTOR, FIXED, COMPOSITION: 4,700 ohms; +5%; 1/2 w; CBZ No. EB-4725; CADV No. 10011-472	"Peak" control shunt
R236	RESISTOR, VARIABLE: composition: 10,000 ohms; +10%; 2 w; CBZ No. type J; CADV No. 10408	"Peak" control
R237	RESISTOR, FIXED, COMPOSITION: 68,000 ohms; +5%; 1/2 w; CBZ No. EB-6835; CADV No. 10011-683	"Peak" control limiting
R238	Same as R112	"QP-100" control

PARTS LIST

REFERENCE SYMBOL	NAME and DESCRIPTION	LOCATING FUNCTION
R239	RESISTOR, FIXED, COMPOSITION: 20,000 ohms; ±5%; 1/2 w; CBZ No. EB-2035; CADV No. 10011-203	V113, plate
R240	RESISTOR, FIXED, COMPOSITION: 27,000 ohms; ±5%; 1/2 w; CBZ No. EB-2735; CADV No. 10011-273	V113, plate
R241	RESISTOR, FIXED, COMPOSITION: 1 megohm; ±5%; 1/2 w; CBZ No. EB-1055; CADV No. 10011-105	V113, grid
R242	Same as R209	V113, plate output
R243	RESISTOR, FIXED, COMPOSITION: 1,800 ohms; ±5%; 1/2 w; CBZ No. EB-1825; CADV No. 10011-182	V113, cathode
R244	RESISTOR, VARIABLE: 1 megohm; ±20%; 1/2 w; CBZ No. GA2G044P105RA; CADV No. 11982-105	"Audio" control
R245	RESISTOR, FIXED, COMPOSITION: 22,000 ohms; ±5%; 1/2 w; CBZ No. EB-2235; CADV No. 10011-223	B + decoupling
R246	RESISTOR, FIXED, COMPOSITION: 2,200 ohms; ±5%; 1/2 w; CBZ No. EB-2225; CADV No. 10011-222	V114, cathode
R247	RESISTOR, FIXED, COMPOSITION: 1,000 ohms; ±5%; 1/2 w; CBZ No. EB-1025; CADV No. 10011-102	V114, cathode
R248	RESISTOR, FIXED, COMPOSITION: 560,000 ohms; ±5%; 1/2 w; CBZ No. EB-5645; CADV No. 10011-564	V114, grid
R249	Not used	
R250	Same as R241	V115, grid
R251	RESISTOR, FIXED, COMPOSITION: 470,000 ohms; ±5%; 1/2 w; CBZ No. EB-4745; CADV No. 10011-474	V115, grid
R252	Same as R105	V115, grid
R253	Same as R105	V115, grid
R254	RESISTOR, FIXED, COMPOSITION: 270,000 ohms; ±5%; 1/2 w; CBZ No. EB-2745; CADV No. 10011-274	V115, plate
R255	RESISTOR, FIXED, COMPOSITION: 180,000 ohms; ±5%; 1/2 w; CBZ No. EB-1845; CADV No. 10011-184	V115, screen grid
R256	RESISTOR, FIXED, COMPOSITION: 390,000 ohms; ±5%; 1/2 w; CBZ No. EB-3945; CADV No. 10011-394	V115, screen grid
R257	Same as R234	V116, plate decoupling
R258	Same as R251	V116, plate to grid
R259	Same as R105	V116, grid
R260	RESISTOR, FIXED, COMPOSITION: 56,000 ohms; ±5%; 1/2 w; CBZ No. EB-5635; CADV No. 10011-563	V116, plate
R261	Same as R234	V116, cathode
R262	Same as R260	V116, plate
R263	RESISTOR, FIXED, COMPOSITION: 3,300 ohms; ±5%; 1/2 w; CBZ No. EB-3325; CADV No. 10011-332	Peak sensitivity limit
R264	RESISTOR, VARIABLE: composition; 5,000 ohms; ±10%; 2 w; CBZ No. type J; CADV No. 10380	PEAK control
R265	Same as R251	V116, grid
R266	Same as R227	p/o peak sensitivity limit
R267	RESISTOR, FIXED, COMPOSITION: 220,000 ohms; ±5%; 1/2 w; CBZ No. type EB-2245; CADV No. 10011-224	X-output limit
R268	RESISTOR, VARIABLE: wirewound; 1,000 ohms; ±5%; 2 w; Helipot Corp. No. AJR1KL5; CADV No. 10896	"X" output
R269	Not used	
R270	RESISTOR, FIXED, WIREWOUND: 15,000 ohms; ±5%; 5 w; Dale Prod. No. W5RS-5; CADV No. 11361-153	V117-V118, cathode circuit
R271	RESISTOR, FIXED, WIREWOUND: 820 ohms; ±1%; 1/2 w; Dale Prod. No. RS-1/2; CADV No. 11674-821	V117, cathode

REFERENCE SYMBOL	NAME and DESCRIPTION	LOCATING FUNCTION
R272	Same as R271	V118, cathode
R273	RESISTOR, FIXED, WIREWOUND: 27,000 ohms; ±1%; 3 w; Dale Prod. No. RS-2; CADV No. 11030-273	V117, plate
R274	RESISTOR, VARIABLE: wirewound; 10,000 ohms; ±10%; 2 w; CMC No. 43C2-10K; CADV No. 11675	"Zero adj"
R275	Same as R273	V118, plate
R276	Same as R193	J117, load
R277	Same as R193	J118, load
R278	Not used	
R279	Same as R121	p/o Z109
R280	Same as R122	p/o Z109
R281	Same as R121	p/o Z109
R282	Same as R121	p/o Z110
R283	Same as R122	p/o Z110
R284	Same as R121	p/o Z110
R285	Same as R121	p/o Z111
R286	Same as R122	p/o Z111
R287	Same as R121	p/o Z111
R288-290	Same as R121	p/o Z112
R291	Same as R234	Audio Output
R292	Same as R150	L127, shunt
S101	SWITCH, ROTARY: p/o Z103 (listed for reference only);	p/o Z103
S102	SWITCH, ROTARY: p/o Z101 (listed for reference only)	p/o Z101
S103	SWITCH, SENSITIVE: spdt; 1 c type contacts; 5 amps; 125 v or 250 vac; CMV No. 1SM1; CADV No. 10948	p/o Z113
S104	Same as S103	p/o Z113
S105	Same as S104	p/o A101
S106-1	SWITCH, IF BANDWIDTH: (Listed for reference only)	Bandwidth
S106-2	Same as S106-1	Bandwidth
S107	SWITCH TOGGLE: spdt; 5 amps; 115 vac; COQ TS3: CADV No. 11640 (optional part if ordered)	Time constant selector
S108	SWITCH, ROTARY: C/O S108-1,-2,-3; 3 section; 5 position; 30° detent; CADV No. 11641	Function switch
S109	SWITCH, TOGGLE: dpdt; CHH No. 83054; CADV No. 10172	Meter response time
T101	TRANSFORMER, RADIO FREQUENCY: rf input coil assembly; Band 1 CADV No. 92141-1	p/o Z105
T102	TRANSFORMER, RADIO FREQUENCY: rf coil assembly; 2nd RF, Band 1 CADV No. 92151-1	p/o Z105
T103	Not used	
T104	TRANSFORMER, RADIO FREQUENCY: rf oscillator coil assembly; Band 1; CADV No. 92161-1	p/o Z105
T105	TRANSFORMER, RADIO FREQUENCY: rf input coil assembly; Band 2 CADV No. 92142-1	p/o Z106
T106	TRANSFORMER, RADIO FREQUENCY: rf coil assembly; Band 2 CADV No. 92152-1	p/o Z106
T107	Not used	
T108	TRANSFORMER, RADIO FREQUENCY: oscillator coil assembly; Band 2 CADV No. 92162-1	p/o Z106
T109	TRANSFORMER, RADIO FREQUENCY: rf input coil assembly; Band 3 CADV No. 92143-1	p/o Z107
T110	TRANSFORMER, RADIO FREQUENCY: rf coil assembly; Band 3 CADV No. 92153-1	p/o Z107

REFERENCE SYMBOL	NAME and DESCRIPTION	LOCATING FUNCTION
T111	TRANSFORMER, RADIO FREQUENCY: rf coil assembly; Band 3 CADV No. 92713-1	p/o Z107
T112	TRANSFORMER, RADIO FREQUENCY: oscillator coil assembly; Band 3 CADV No. 92163-1	p/o Z107
T113	TRANSFORMER, RADIO FREQUENCY: rf input coil assembly; Band 4 CADV No. 92144-1	p/o Z108
T114	TRANSFORMER, RADIO FREQUENCY: 2nd rf coil assembly; Band 4 CADV No. 92154-1	p/o Z108
T115	TRANSFORMER, RADIO FREQUENCY: rf mixer coil assembly; Band 4 CADV No. 92714-1	p/o Z108
T116	TRANSFORMER, RADIO FREQUENCY: oscillator coil assembly; Band 4 CADV No. 92164-1	p/o Z108
T117	TRANSFORMER, RADIO FREQUENCY: rf input coil assembly; Band 5 CADV No. 92145-1	p/o Z109
T118	TRANSFORMER, RADIO FREQUENCY: n 2nd rf coil assembly; Band 5 CADV No. 92155-1	p/o Z109
T119	TRANSFORMER, RADIO FREQUENCY: rf mixer coil assembly; Band 5 CADV No. 92715-1	p/o Z109
T120	TRANSFORMER, RADIO FREQUENCY: rf oscillator coil assembly; Band 5 CADV No. 92165-1	p/o Z109
T121	TRANSFORMER, RADIO FREQUENCY: rf input coil assembly; Band 6 CADV No. 92146-1	p/o Z110
T122	TRANSFORMER, RADIO FREQUENCY: rf coil assembly; Band 6 CADV No. 92156-1	p/o Z110
T123	TRANSFORMER, RADIO FREQUENCY: rf mixer coil assembly; Band 6 CADV No. 92716-1	p/o Z110
T124	TRANSFORMER, RADIO FREQUENCY: oscillator coil assembly; Band 6 CADV No. 92166-1	p/o Z110
T125	TRANSFORMER, RADIO FREQUENCY: rf input coil assembly; Band 7 CADV No. 92147-1	p/o Z111
T126	TRANSFORMER, RADIO FREQUENCY: 2nd rf coil assembly; Band 7 CADV No. 92157-1	p/o Z111
T127	TRANSFORMER, RADIO FREQUENCY: rf mixer coil assembly; Band 7 CADV No. 92717-1	p/o Z111
T128	TRANSFORMER, RADIO FREQUENCY: rf oscillator coil assembly; Band 7; CADV No. 92167-1	p/o Z111
T129	TRANSFORMER, RADIO FREQUENCY: rf input stage coil assembly; Band 8; CADV No. 92148-1	p/o Z112
T130	TRANSFORMER, RADIO FREQUENCY: 2nd rf stage coil assembly;Band 8 CADV No. 92158-1	p/o Z112
T131	TRANSFORMER, RADIO FREQUENCY: rf mixer coil assembly; Band 8 CADV No. 92718-1	p/o Z112
T132	TRANSFORMER, RADIO FREQUENCY: rf oscillator coil assembly; Band 8; CADV No. 92168-1	p/o Z112
T133	TRANSFORMER, AUDIO FREQUENCY: plate coupling type; CADV No. 10128	Audio output
V101	ELECTRON TUBE: type 5814A	Impulse Gen.
V102	ELECTRON TUBE: 6688A	RF amplifier
V103	ELECTRON TUBE: type 5670	RF mixer oscillator
V104	Same as V103	IF converter
V105	ELECTRON TUBE: 6136/6AU6WA	1st IF amplifier
V106	Same as V105	2nd IF amplifier
V107	Same as V105	3rd IF amplifier

REFERENCE SYMBOL	NAME and DESCRIPTION	LOCATING FUNCTION
V108	Same as V105	4th IF amplifier
V109	Same as V105	5th IF amplifier
V110	ELECTRON TUBE: 6100/6C4WA	Beat frequency oscillator
V111	Same as V110	Cathode follower amplifier
V112	ELECTRON TUBE: 5726/6AL5W	Detector
V113	Same as V105	Audio amplifier
V114	Same as V101	Audio amplifier
V115	Same as V105	Pulse amplifier
V116	Same as V101	Trigger
V117	Same as V110	VTVM
V118	Same as V110	VTVM
W101	CABLE ASSEMBLY, RADIO FREQUENCY: 16" long, consists of P102 and RG-178B/U single shielded coaxial cable; CADV No. 11989-9	"RF input" to J102
W102	Not used	
W103	CABLE ASSEMBLY, RADIO FREQUENCY: 5-1/2" long; consists of P103 and RG-178B/U coaxial cable; CADV No. 11989-1	Connects Z101 to Z103
W104	CABLE ASSEMBLY, RADIO FREQUENCY: 30" long; consists of P104 and RG-178B/U coaxial cable; CADV No. 11989-7	Delay line for Z102
W105	CABLE ASSEMBLY, RADIO FREQUENCY: 5-1/2" long; consists of P105 and RG-178B/U coaxial cable; CADV No. 11989-2	Connects Z102 to Z103
W106	CABLE ASSEMBLY, RADIO FREQUENCY: 23" long; consists of P106 and RG-178B/U coaxial cable; CADV No. 11989-3	Connects Z103 to Z104
W107	CABLE ASSEMBLY, RADIO FREQUENCY: 3" long; consists of P107; and RG-178B/U coaxial cable; CADV No. 11989-8	Connects Z104 to A101
W108	Not used	
W109	CABLE ASSEMBLY, RADIO FREQUENCY: 14 " long; consists of P109 and RG-178B/U coaxial cable; p/o Z113; CADV No. 11989-4	Connects J109 to Z113
W110	CABLE ASSEMBLY, RADIO FREQUENCY: 12" long; consists of P110 and RG-178B/U coaxial cable; CADV No. 11989-5	Connects Z113 to Z114
W111	CABLE ASSEMBLY, RADIO FREQUENCY: 12" long; consists of P111 and RG-178B/U coaxial cable; CADV No. 11989-6	Connects Z114 to J111
W112	Cable RADIO FREQUENCY: 28" long; RG-178B/U coaxial cable; CADV No. 12027	Connects to J113
W113	Not used	
W114	CABLE RADIO FREQUENCY: 14-1/2" long; RG-178B/U coaxial cable; CADV No. 12027	Connects to J114
XV101	SOCKET, ELECTRON TUBE: type TS103C01; CMG No. 53F13381; CADV No. 10036	Socket, V101
XV102	Same as XV101	Socket, V102
XV103	Same as XV101	Socket, V103
XV104	Same as XV101	Socket, V104
XV105	SOCKET, ELECTRON TUBE: type TS102C01; CEB No. 7676; CADV No. 10118	Socket, V105
XV106	Same as XV105	Socket, V106
XV107	Same as XV105	Socket, V107

PARTS LIST

REFERENCE SYMBOL	NAME and DESCRIPTION	LOCATING FUNCTION
XV108	Same as XV105	Socket, V108
XV109	Same as XV105	Socket, V109
XV110	Same as XV105	Socket, V110
XV111	Same as XV105	Socket, V111
XV112	Same as XV105	Socket, V112
XV113	Same as XV105	Socket, V113
XV114	Same as XV101	Socket, V114
XV115	Same as XV105	Socket for V115
XV116	Same as XV101	Socket for V116
XV117	Same as XV105	Socket for V117
XV118	Same as XV105	Socket for V118
Y101	CRYSTAL UNIT QUARTZ: 6,100 kc operating frequency; CADV No. 11625	p/o Z113
Y102	CRYSTAL UNIT QUARTZ: 1,601 kc operating frequency; CADV No. 11626	V110, grid circuit
Z101	ATTENUATOR, VARIABLE: 150 kc to 32 mc range; consists of attenuator pads AT101 thru AT106; 50 ohm input and output impedance; and S102; CADV No. 92138-1	Attenuator assembly
Z102	GENERATOR, IMPULSE NOISE: Mercury contact switch, solenoid operated; CADV No. 92149-1 Includes J104 and J105	Impulse Noise Generator
Z103	SELECTOR SWITCH ASSEMBLY, RADIO FREQUENCY: Includes S101, W103, W105, W106 and the impulse generator pad; CADV No. 92160-1	Impulse or Radio Freq. Input Selector
Z104	FILTER, LOW PASS: 50 ohms input and output impedance; CADV No. 92550-1	Attenuates signals above tuning range
Z105	RADIO FREQUENCY, AMPLIFIER SUB-ASSEMBLY: Band 1 consists of 3 tuned transformers and associated components; CADV No. 92171-1	p/o A101
Z106	RADIO FREQUENCY, AMPLIFIER SUB-ASSEMBLY: Band 2 consists of 3 tuned transformers and associated components; CADV No. 92172-1	p/o A101
Z107	RADIO FREQUENCY, AMPLIFIER SUB-ASSEMBLY: Band 3 consists of 4 tuned transformers and associated components; CADV No. 92173-1	p/o A101
Z108	RADIO FREQUENCY, AMPLIFIER SUB-ASSEMBLY: Band 4 consists of 4 tuned transformers and associated components; CADV No. 92174-1	p/o A101
Z109	RADIO FREQUENCY, AMPLIFIER SUB-ASSEMBLY: Band 5 consists of 4 tuned transformers and associated components; CADV No. 92175-1	p/o A101
Z110	RADIO FREQUENCY, AMPLIFIER SUB-ASSEMBLY: Band 6 consists of 4 tuned transformers and associated components; CADV No. 92176-1	p/o A101
Z111	RADIO FREQUENCY, AMPLIFIER SUB ASSEMBLY: Band 7 consists of 4 tuned transformers and associated components; CADV No. 92177-1	p/o A101
Z112	RADIO FREQUENCY, AMPLIFIER SUB-ASSEMBLY: Band 8 consists of 4 tuned transformers and associated components; CADV No. 92178-1	p/o A101
Z113	CONVERTER, IF AMPLIFIER: consists of 4.5 mc and 1600 kc tuned transformers and associated components; CADV No. 92967-1	p/o A101
Z114	CALIBRATION, CONTROL NETWORK: consists of resistive pads and K101 for control of overall gain; CADV No. 92159-1	Calibration control

REFERENCE SYMBOL	NAME and DESCRIPTION	LOCATING FUNCTION
Z115	FILTER, CRYSTAL: 1600 kc center frequency; Collins Radio; type X1M60F3K2; CADV No. 11673	Narrow band IF filter

POWER SUPPLY

REFERENCE SYMBOL	NAME and DESCRIPTION	LOCATING FUNCTION
C301	CAPACITOR, FIXED, PAPER, DIELECTRIC: 250,000 mmf; 1 amp; 15 vac CD No. NFT-420; CADV No. 11162	Regulator input
C302	Same as C301	Regulator input
C303	CAPACITOR, FIXED, PAPER, DIELECTRIC; 15,000 mmf; +20% tol; 400 vdcw; CD No. NFT-104; CADV No. 11168	Regulator input
C304	Same as C303	Regulator input
C305	CAPACITOR, FIXED, ELECTROLYTIC: two sections, 70-70 mfd; -10%; +250 % tol; 300 vdcw; CD No. CE42B-700N; CADV No. 11008	B + filter
C306	Same as C305	B + filter
C307	CAPACITOR, FIXED, ELECTROLYTIC: single section; 300 mfd; 150 vdcw; CD No. CE41B301J; CADV No. 10273	C-filter
C308	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 20,000 mmf; GMV tol; 450 vdcw; CADV No. 10493	C-filter
C309	CAPACITOR, FIXED, PAPER DIELECTRIC: 3 mfd; 600 vdcw; single section; CAW No. JP09MS; CADV No. 11527	Power factor stabilizer
C310	CAPACITOR, FIXED, PAPER DIELECTRIC: 500,000 mmf; 600 vdcw; CD No. DYR6060J; CADV No. 10021	Contact filter
C311	CAPACITOR, FIXED, PAPER DIELECTRIC: 1.4 mfd; +20% tol; 60 vdcw; CD No. GMY-R102; CADV No. 11170	Regulator input
CR301	SEMICONDUCTOR DEVICE DIODE: 750 ma; 400 v; CBAT type 754; CADV No. 11718	B + supply rectifier
CR302	Same as CR301	C- supply
CR303	Same as CR301	B + supply
CR304	Same as CR301	B + supply
CR305	Same as CR301	B + supply
CR306 thru CR399	Not used	
E300	Not used	
E301	SHIELD, ELECTRON TUBE: brass nickel plated; JAN type No. TS102U03; CADV No. 10039	V301, tube shield
E302	Same as E301	V302, tube shield
E303	Same as E301	V303, tube shield
E304	COVER, ELECTRICAL CONNECTOR: aluminum sandblasted finish; CPH No. 9760-22; CADV No. 10157	Cap and chain for J303
E305	POST, BINDING: push type; CEB No. 6603; CADV No. 10171	Ground connection
F301	FUSE CARTRIDGE: 3 amp; 250 v; CLF No. 312003; CADV No. 10800	AC line
F302	Same as F301	AC line
F303	Same as F301	Spare fuse
F304	Same as F301	Spare fuse
F305 thru F399	Not used	
H301	GASKET: rectangular; CADV No. 20054	Front panel

PARTS LIST

REFERENCE SYMBOL	NAME and DESCRIPTION	LOCATING FUNCTION
H302	Not used	
H303	Same as H302	Fuse holder
H304	Same as H302	Fuse holder
H305	Same as H302	Fuse holder
H306	BOOT, DUST AND MOISTURE SEAL: black silicon "O" ring and sleeve; CADR No. H-1267; CADV No. 70084	Toggle switch
H307	GASKET: metalastic material; CADV No. 20062	J303, connector
H308	GASKET: metalastic material; CADV No. 20063	J301, connector
H309	Same as H308	J302, connector
I301	LAMP, INCANDESCENT: 6-8 v; 0.15 amp; GE No. 47; CADV No. 10051	Power supply "ON"
J301	CONNECTOR, RECEPTACLE, ELECTRICAL: 5 contacts, 5 female connector mating ends; CED No. MS3102E-14S-5S; CADV No. 11179	Output
J302	CONNECTOR, RECEPTACLE, ELECTRICAL: 3 contacts, 3 male connector mating ends; CED No. MS3102E-14S-7P; CADV No. 11180	AC line input
J303	CONNECTOR, RECEPTACLE, ELECTRICAL: 2 rectangular female contacts; 1 ground pin; CPH No. 7-864B; CADV No. 11505	Recorder power
K301	RELAY, ARMATURE: (electro-mechanical type regulator); CBOE type No. 9518-1; CADV No. 11165	Regulator
K302 thru K399	Not used	
L301	CHOKE, RADIO FREQUENCY: 100 uh; single winding; CADV No. 90292-1	Regulator input
L302	Not used	
L303	CHOKE, RADIO FREQUENCY: 1 amp current rating; 4 mh; CADV No. 11188	Regulator input
L304 a,b	CHOKE, FILTER: dual type, hermetically sealed; CADV No. 11280	Filter for B+ and C-
R301	RESISTOR, FIXED, WIREWOUND: non-inductive winding; 56 ohms; ±5%; tol; 25 watt; COM type No. RG-25; CADV No. 11173	Regulator shunt
R302	RESISTOR, FIXED, WIREWOUND: 7.1 ohms; 11 watts; COM No. RW29V7R1; CADV No. 11157-7R1	Regulator shunt
R303	RESISTOR, FIXED, WIREWOUND: 25 ohms; 11 watts; COM No. RW29V250; CADV No. 11157-250	Regulator shunt
R304	RESISTOR, FIXED, WIREWOUND: 50 ohms; 11 watts; COM No. RW29V500; CADV No. 11157-500	Regulator shunt
R305	RESISTOR, FIXED, WIREWOUND: 71 ohms; 11 watts; COM No. RW29V710; CADV No. 11157-710	Regulator shunt
R306	RESISTOR, FIXED, WIREWOUND: 120 ohms; 11 watts; COM No. RW29V121; CADV No. 11157-121	Regulator shunt
R307	RESISTOR, FIXED, WIREWOUND: 160 ohms; 11 watts; COM No. RW29V161; CADV No. 11157-161	Regulator shunt
R308	RESISTOR, FIXED, WIREWOUND: 250 ohms; 11 watts; COM No. RW29V251; CADV No. 11157-251	Regulator shunt
R309	RESISTOR, FIXED, WIREWOUND: 310 ohms; 11 watts; COM No. RW29V311; CADV No. 11157-311	Regulator shunt
R310	RESISTOR, FIXED, WIREWOUND: 350 ohms; 11 watts; COM No. RW29V351; CADV No. 11157-351	Regulator shunt
R311	RESISTOR, FIXED, WIREWOUND: 6,800 ohms; ±5% tol; 3 watts; CSF No. type 242E; CADV No. 11166-682	Solenoid current limiting
R312	RESISTOR, FIXED, WIREWOUND: 50,000 ohms; ±5%; tol. 10 watts; Dale Prod. No. W10-RS-10; CADV No. 11163	Vol. divider "REG ADJ" control
R313	RESISTOR, VARIABLE: wirewound; element; 1 sect; 15,000 ohms; ±5% tol.; 3 watts; CMC No. 58C215K; CADV No. 11171	Regulated output adjust
R314	RESISTOR, FIXED, WIREWOUND: non-inductive winding; 100 ohms; ±5% tol; 25 watts; Dale Prod. No. NH-25; CADV No. 10705-101	400 cycle compensating
R315	RESISTOR, FIXED, COMPOSITION: 240 ohms; ±5% tol; 2 watts; CGZ No. HB-2415; CADV No. 10377-241	Gaseous regulator
R316	RESISTOR, FIXED, COMPOSITION: 10 ohms; ±5% tol; 1/2 watt; CBZ No. EB-1005; CADV No. 10011-100	C310, peak limiting
R317	RESISTOR, FIXED, WIREWOUND: 15,000 ohms; ±5% tol; 5 watts; Dale Prod. No. W5-RS-5; CADV No. 11361-153	Vol. divider "REG ADJ" control
R318	RESISTOR, FIXED, COMPOSITION: 6,200 ohms; ±5% tol; 1 watt; CBZ No. GB-6225; CADV No. 10012-622	R313, shunt regulator
R319	RESISTOR, FIXED, COMPOSITION: 100 ohms; ±5% tol. 1 watt; CBZ No. GB-1015; CADV No. 10012-101	CR302, current limiting
S301	SWITCH, TOGGLE: DPDT: 2 pos., 1 amp, 250 v; 3 amp; 125 v; AC-DC; CHH No. 83054 CADV No. 10172	Power on-off
S302	Same as S301	115-240 V selector
T301	TRANSFORMER, POWER, STEP-DOWN AND STEP-UP: hermetically sealed; fully enclosed; metal case; WAHLGREN No. 3637; MIL type No. TF1SX-03JA; CADV No. 11279	Plate and filament
T302	TRANSFORMER, POWER ISOLATION: hermetically sealed; fully enclosed; metal case; WAHLGREN No. 3636; MIL type No. TF1SX0-1JA; CADV No. 11278	Isolation
V301	ELECTRON TUBE: glass envelope; voltage regulator; CADV No. 0B2WA	C- regulator
V302	ELECTRON TUBE: glass envelope; amplifier; CADV No. 6005/6AQ5W	Regulator (control)
V303	Same as V301	Clamps reg-ohm
XF301	FUSE HOLDER: extractor post type CLF No. 342003; CADV No. 11161	F301, holder
XF302	Same as XF301	F302, holder
XF303	Same as XF301	Spare fuse
XF304	Same as XF301	Spare fuse
XI301	LIGHT INDICATOR: with lens; CAYS No. 40; CADV No. 10115	Pilot light
XK301	SOCKET, RELAY: phenolic board; incl. 1/15 clip type contacts; CBOE No. 300. 50; CADV No. 11164	K301, regulator
XV301	SOCKET, ELECTRON TUBE: JAN type TS102P01; CEB No. 7676; CADV No. 10118	V301, tube
XV302	Same as XV301	V302, tube
XV303	Same as XV301	V303, tube
Z301	FILTER, ASSEMBLY, ELECTRICAL: c/o four feed-thru capacitors; 2 coils; CADV No. 90386-1	Line noise

ACCESSORIES

REFERENCE SYMBOL	NAME and DESCRIPTION	LOCATING FUNCTION
C401	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 10 mmf; 600 vdcw; NPO Tubular type with radial wire leads; CBN No. TCZ-10R; CADV No. 11658-10R	p/o E407
C402	CAPACITOR, FIXED, PLASTIC, DIELECTRIC: mylar foil; .039 uf ±2% tol. 100 vdcw; Electron Products No. E-100; CADV No. 11466-393	p/o E408

PARTS LIST

REFERENCE SYMBOL	NAME and DESCRIPTION	LOCATING FUNCTION
C403	CAPACITOR, FIXED, PLASTIC, DIELECTRIC: mylar foil, .02 uf; ±2% tol. 100 vdcw; Electron Products No. E-100; CADV No. 11466-203	p/o E408
C404	CAPACITOR, FIXED, PLASTIC, DIELECTRIC: mylar foil; .01 uf; ±2% tol. 100 vdcw; Electron Products No. E-100; CADV No. 11466-103	p/o E408
C405	CAPACITOR, FIXED, PLASTIC, DIELECTRIC: mylar foil .00532 uf; ±2% tol; 100 vdcw; Electron Products No. E-100; CADV No. 11466-5321	p/o E408
C406	CAPACITOR, FIXED, PLASTIC, DIELECTRIC: mylar foil .00279 uf; ±2% tol; 100 vdcw; Electron Products No. E-100; CADV No. 11466-2791	p/o E408
C407	CAPACITOR, FIXED, MICA DIELECTRIC: 1430 mmf; ±2%; 500 vdcw; CMF No. DM-19-1430-G; CADV No. 11643-1431	p/o E408
C408	CAPACITOR, FIXED, MICA DIELECTRIC: 740 mmf; ±1%; 300 vdcw; CMF No. DM-15-741-F; CADV No. 11654-741	p/o E408
C409	CAPACITOR, FIXED, MICA DIELECTRIC: 150 mmf; ±2%; 500 vdcw; CMF No. DM-15-150G; CADV No. 11655-151	p/o E408
CP401	ADAPTER, COAXIAL CONNECTOR: type UG-201A/U; J407 at one end; P406 at other end; CCRV UG-201A/U; CADV No. 11663	Connector adapter
E401	METER, REMOTE: consists of M401 and P408; CADV No. 90078-11	Remote meter
E402	ANTENNA, ROD TYPE: 41 inches long, when fully extended with P401 at one end. CADV No. 92197-3	Antenna
E403	GROUND PLANE, ANTENNA COUPLER: consists of 12 inch square of aluminum; CADV No. 92199-3	Ground plane
E404	ANTENNA, LOOP: consists of insulated loop and connector; CADV No. 90799-3	Loop probe
E405	COUPLER ADAPTER, ANTENNA: connects to J405 of E407; CADV No. 92192-3	Two terminal adapter
E406	PROBE, RF CURRENT: consists of a secondary winding and J414 inclosed in an electrostatic shield; CADV No. 91550-1	Conducted measurements
E407	COUPLER, ANTENNA: consists of 8 matching transformers; matches high impedance input to a 50 ohm output; CADV No. 92198-3	Rod antenna matching network
E408	ANTENNA, LOOP: consists of 8 matching transformers; matches loop to a 50 ohm output; CADV No. 92200-3	Loop antenna
HT401	HEADSET RADIO: magnetic type; 600 ohms impedance; CTE No. TC-149E; CADV No. 10796	Headphones
J401	CONNECTOR, PLUG, ELECTRICAL: 5 round; male contacts; CED No. CA3106F14S5P; CADV No. 11177	p/o W401
J402	CONNECTOR, PLUG, ELECTRICAL: 3 round female contacts;MS3106E14S7S CADV No. 11136	p/o W402
J403	CONNECTOR, BINDING POST: screw type (See P405) CBDW No. 29-3 red (modified) CADV No. 51541	p/o E405
J404	CONNECTOR, BINDING POST: screw type, CBDW No. 29-3 black; CADV No. 11665-1	p/o E404
J405	CONNECTOR, RECEPTACLE, ELECTRICAL: BNC type receptacle, CBWT No. 60-T3000; CADV No. 11662	E407, input
J406	CONNECTOR, RECEPTACLE, ELECTRICAL: type "N" coaxial connector; (listed for reference only)	p/o E406
J407	CONNECTOR, RECEPTACLE, ELECTRICAL: one end of CP401, (listed for reference only)	p/o CP401
J408	PLUG, TELEPHONE: 3 conductors CRL No. PJ068B; CADV No. 10088	p/o W408
J409	JACK, TELEPHONE: for 2 conductor plug; CMA No. 100A; CADV No. 10087	p/o W405

REFERENCE SYMBOL	NAME and DESCRIPTION	LOCATING FUNCTION
J410	CONNECTOR, RECEPTACLE, ELECTRICAL: type UG-89/U; (listed for ref. only)	p/o E404
J411	CONNECTOR, RECEPTACLE, ELECTRICAL: CANS No. UG-625/U; CADV No. 10723	E407, output
J412	Same as J411	E408, output
M401	Same as M101	Remote meter
MP401	BAG, CABLE: cannon duck; olive drab; CADV No. 91981-2	Cable bag
MP402	CASE, METER: grey, plastic material; CADV No. 91595-10	RI-FI meter
MP403	CASE, POWER SUPPLY: grey, plastic material; CADV No. 91595-4	Power supply case
MP404	BAG, TRIPOD: canvas duck; olive drab; CADV No. 92049-1	Tripod case
MP405	CASE, ACCESSORIES: shape, grey plastic material; CADV No. 92220-3	Accessory case
MP406	TRIPOD: collapsible type CADV No. 91933-2	Antennas or RI-FI meter support
P400	CONNECTOR, PLUG, ELECTRICAL: 5 round female contacts; CED No. CA3106F14S5S; CADV No. 11176	p/o W401
P401	CONNECTOR, PLUG, ELECTRICAL: type UG-260B/U; CCRV No. 02-602; CADV No. 11156	p/o W403
P402	Same as P401	p/o W403
P403	CABLE, ASSEMBLY POWER: 3 pin type connector, w/cable; (For reference only)	p/o W402
P404	CONNECTOR, PLUG, ELECTRICAL: coaxial connector; CBWT No. 300-T1000; CADV No. 11671	p/o E402
P405	CONNECTOR, PLUG, ELECTRICAL: pin type mates with center conductor of J403 (for reference only)	p/o J403
P406	CONNECTOR, PLUG, ELECTRICAL: one end of connector adapter (for reference only)	p/o CP401
P407	Not used	
P408	CONNECTOR, RECEPTACLE, ELECTRICAL: 3 pin; CED No. MS3102A10SL3P; CADV No. 10042	p/o E401
P409 thru P413	Not used	
P414	CONNECTOR, PLUG, ELECTRICAL: type No. UG-260/U; CCRV No. 02-600; CADV No. 10228	p/o W404
P415	PLUG, TELEPHONE: 2 conductors; CRL No. PJ-055B; CADV No. 10089	p/o W405
P416	CONNECTOR, PLUG, ELECTRICAL: 1 male contact; Electro-Physics Lab No. P-95-2300: CADV No. 11681	p/o W406
P417	CONNECTOR, PLUG, ELECTRICAL: 3 round female contacts; type MS3106B10SL3S; CADV No.10069	p/o W408
P418	PLUG, TELEPHONE: 3 conductors; CRL No. PJ-068; CADV No. 10088	p/o W408
S401-1	SWITCH ROTARY: p/o loop antenna; (for reference only)	p/o E408
S401-2	Same as S401-1	p/o E408
S402-1	SWITCH ROTARY: p/o loop antenna; (for reference only)	p/o E408
S402-2	Same as S402-1	p/o E408
S402-3	Same as S402-1	p/o E408
T401	TRANSFORMER, RADIO FREQUENCY: impedance matching; Band 1 CADV No. 92201-1	p/o E407
T402	TRANSFORMER, RADIO FREQUENCY: impedance matching; Band 2 CADV No. 92202-1	p/o E407
T403	TRANSFORMER, RADIO FREQUENCY: impedance matching; Band 3 CADV No. 92203-1	p/o E407

PARTS LIST

REFERENCE SYMBOL	NAME and DESCRIPTION	LOCATING FUNCTION
T404	TRANSFORMER, RADIO FREQUENCY: impedance matching, Band 4 CADV No. 92204-1	p/o E407
T405	TRANSFORMER, RADIO FREQUENCY: impedance matching; Band 5 CADV No. 92205-1	p/o E407
T406	TRANSFORMER, RADIO FREQUENCY: impedance matching; Band 6 CADV No. 92206-1	p/o E407
T407	TRANSFORMER, RADIO FREQUENCY: impedance matching; Band 7 CADV No. 92207-1	p/o E407
T408	TRANSFORMER, RADIO FREQUENCY: impedance matching; Band 8 CADV No. 92208-1	p/o E407
T409 and T410	Not used	
T411	TRANSFORMER, RADIO FREQUENCY: impedance matching; Band 1 CADV No. 92211-1	p/o E408
T412	TRANSFORMER, RADIO FREQUENCY: impedance matching; Band 2 CADV No. 92212-1	p/o E408
T413	TRANSFORMER, RADIO FREQUENCY: impedance matching; Band 3 CADV No. 92213-1	p/o E408
T414	TRANSFORMER, RADIO FREQUENCY: impedance matching; Band 4 CADV No. 92214-1	p/o E408
T415	TRANSFORMER, RADIO FREQUENCY: impedance matching; Band 5 CADV No. 92215-1	p/o E408
T416	TRANSFORMER, RADIO FREQUENCY: impedance matching; Band 6 CADV No. 92216-1	p/o E408

REFERENCE SYMBOL	NAME and DESCRIPTION	LOCATING FUNCTION
T417	TRANSFORMER, RADIO FREQUENCY: impedance matching; Band 7 CADV No. 92217-1	p/o E408
T418	TRANSFORMER, RADIO FREQUENCY: impedance matching; Band 8 CADV No. 92218-1	p/o E408
W401	CABLE ASSEMBLY, POWER: 10 ft. 0 in. cable c/o 5 conductors; incl. P400 and J401; CADV No. 91487-1	Power cable assembly
W402	CABLE ASSEMBLY, POWER: (6ft. 6 in.) 3 conductors; incl. J402 and plug P403; CADV No. 91258-1	Connects J302 to AC power source
W403	CABLE ASSEMBLY, RADIO FREQUENCY: RG-55A/U cable; (20 ft. lg.) including terminations P401 and P402; CADV No. 92191-1	RF transmission line
W404	CABLE ASSEMBLY, SPECIAL PURPOSE ELECTRICAL: (3 ft.long) has P414 one end; CADV No. 90071-1	Oscilloscope cable
W405	CABLE ASSEMBLY, SPECIAL PURPOSE ELECTRICAL: RG-108/U cable; 20 ft. long incl. J409 and P415 each end; CADV No. 90074-1	Headphone extension
W406	CABLE ASSEMBLY, SPECIAL PURPOSE ELECTRICAL: shielded wire; 6 ft. 6 in. lg. ; terminated one end w/2 alligator clips and P416 other end; CADV No. 92244-2	X output cable
W407	CABLE ASSEMBLY, SPECIAL PURPOSE ELECTRICAL: RG-108/U cable; 6 ft 6 in. lg. ; terminated one end w/2 alligator clips and P418 other end; CADV No. 90075-4	Y output cable
W408	CABLE ASSEMBLY, SPECIAL PURPOSE ELECTRICAL: RG-108/U cable; (20 ft. lg.) incl J408 and P417 each end; CADV No. 90075-2	Remote meter

RADIATION HAZARDS

IN RADIO INTERFERENCE MEASUREMENT

1. Biological damage from exposure to intense RF radiation has been known for several years but only recently have quantitative limits been established.

2. A tri-service limit for exposure to RF radiation has been established at .01 watts/cm^2 at any frequency. This is 194 volts/meter assuming linearly polarized plane waves. General Electric has proposed that a maximum safe limit of .001 watts/cm^2 (61 volts/meter) be used for continuous exposure and that .01 watts/cm^2 be an absolute maximum not to be exceeded except under emergency conditions.

3. It is possible that personnel operating Stoddart equipment will be exposed to power densities greater than .01 watts/cm^2. This will probably occur in locations where the rf field will not be linearly polarized plane waves such as the Fresnel Zone and in close proximity to magnetrons and klystrons.

4. It is suggested that before taking measurements near suspected or known strong radiation sources that reliable information on intensity be obtained.

Direct measurements of strong signal sources can be made with RI-FI equipment if the frequency is in the tuning range. Most RI-FI equipment does not have sufficient voltage range or shielding effectiveness to accurately measure to 194 volts/meter using standard antennas. In some situations, involving concentrated fields, the use of loop probes with their large antenna factors would enable approximate measurement. Limitations in RI-FI equipment shielding sometimes permits full scale meter indication when tuned to a very strong signal even with the antenna disconnected. Needless to say, the operator should be concerned when this occurs.

The following chart provides approximate equipment range limits (full scale) in volts/meter with and without pickup devices.

The equipment would be standardized for gain in accordance with instructions on the charts supplied. Then the input attenuator should be placed in the maximum position. Continuous wave signals would be measured in FI function switch position. Pulsed signals are measured with PEAK function.

STODDART NO. 40019-A

Equipment	Antenna	Approximate field strength volts/meter Equivalent radiation levels given in table below
NM-10A	Half meter rod	2
	30" loop (90117-2)	10
(14 kc to 250 kc)	6" loop (90114-2)	100
	Loop probe (90185-1)	1000*
	No antenna (or cable)	100 to 200
NM-20B	41" rod (90291-2)	2
	Loop antenna (90298-2)	.1
(150 kc to 25 mc)	Loop probe (90185-2)	10*
	No antenna (or cable)	20
NM-30A	Tuned dipole	1 to 50
	Loop antenna (90799-2)	170 to 500*
(20 mc to 400 mc)	No antenna (or cable)	10 to 500
NM-50	Tuned dipole	30 to 180
(375 mc to 1000 mc)	No antenna (or cable)	100 to 180

Field Strength volts/meter	Radiation Level watts/cm^2
0.1	0.265×10^{-8}
2.0	1.06×10^{-6}
10.	0.265×10^{-4}
20	1.06×10^{-4}
30	2.39×10^{-4}
50	6.63×10^{-4}
100	0.265×10^{-2}
170	0.766×10^{-2}
180	0.86×10^{-2}
200	1.06×10^{-2}
500	6.63×10^{-2}
1000	0.265

$$P = \frac{(E)^2}{120\pi} = .00265(E)^2 \frac{\text{watts}}{(\text{meter})^2}$$

P = Radiation Level

E = Field Strength - $\frac{\text{volts}}{\text{meter}}$

$$P \frac{(\text{watts})}{\text{cm}^2} = 10^{-4} \times p \frac{(\text{watts})}{(\text{meter})^2}$$

* Maximum measurement shown using loop probe antenna is only practical if RI-FI equipment is not exposed to strong RF field.

ENGINEERING DEPT.
August 27, 1959

STODDART AIRCRAFT RADIO CO., INC.
6644 Santa Monica Boulevard
Hollywood 38, California

STODDART NO. 40019-A

Warranty

Stoddart Electro Systems warrants each RFI Meter manufactured by them to be free from defects in workmanship and material. Our liability under this warranty is limited to servicing or adjusting any instrument returned to the factory for that purpose and to replace any defective parts thereof. Klystron tubes, electron tubes, fuses and batteries are specifically excluded from any liability.

This warranty is effective for one year after delivery to the original purchaser. If the fault has been caused by misuse or mishandling, repairs will be billed to the purchaser. In this case, an estimate will be submitted before the work is begun.

In the event that any defect occurs, Stoddart Electro Systems should be advised of all details and the model and serial number of the equipment. Shipping instructions and service data will be provided. To ensure safe handling, all equipment should be forwarded with protective covers in place and in strong exterior containers surrounded by several inches of rubberized hair or similar shock-absorbing material to the factory or authorized repair station via scheduled Air Freight.

CLAIM FOR DAMAGE IN TRANSIT

Equipment should be tested as soon as it is received. If it fails to operate properly, or is damaged in any manner, a claim should be filed with the transportation company. A report of the damage should be obtained by the claim agent, and this report forwarded to Stoddart Electro Systems with model and serial number of the equipment. Advice regarding repair or replacement will be supplied immediately upon receipt of this information

STODDART ELECTRO SYSTEMS
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